ARCHIVES OF OPHTHALMOLOGY.

ON THE TESTING OF THE LIGHT-SENSE AND THE QUANTITATIVE COLOR-SENSE, AND ITS APPLICATION TO THE EXAMINATION OF THE VISUAL POWER OF RECRUITS.

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(*With plates vi. and vii., of vol. xviii., German edition.*)

Condensed and translated by H. KNAPP.

IN examining the visual power of recruits we are usually satisfied with the determination of the visual acuteness and the refraction, the latter only to ascertain the presence of the prescribed acuteness. As for this purpose we depend on the statements and honesty of the recruits, we naturally would like to possess a method of parallel examination, similar to the ophthalmoscopic determination of refraction. Experiments in this direction have led me to devise *plates for testing light-sense anomalies*. They were suggested to me by JANNIK BJERRUM'S: Investigations of the Light- and Space-Sense (Gräfe's *Arch.*, xxx., No. 2). Instead of letters in different intensity of gray, I chose the black letters of Snellen on a background with three different shades of gray. These shades were found empirically. Plate i. being Snellen's well-known plate, black on white, I experimented until, with good illumination, plate ii. showed still $S = \frac{6}{6}$, plate iii. $S = \frac{6}{6}$, and plate iv. $S = \frac{6}{18}$. By drawing a dense linen curtain over the window, plate ii. gave $S = \frac{6}{6}$; plate iii. $S = \frac{6}{18}$; plate iv. $S = \frac{6}{36}$. If S is below normal, the patient may step nearer to the plates until he recognizes $\frac{6}{6}$ type. The diminution of his light-sense can then easily be determined and numerically expressed, namely, in the same way as if he stood 6 *m* distant from the types. I used these types with great

satisfaction for 3 years. A year ago Dr. WOLFFBERG sent me his new and simple apparatus, by which the light-sense is examined combinedly with the quantitative color-sense. This apparatus, which has rendered me excellent service, is described in Gräfe's *Archives*, xxxi., No. 1, p. 1.; *Zeh. klin. Monatsbl.*, 1886, p. 359.

According to Wolffberg the *quantitative color-perception of the macula lutea—cFm*—is greater in anomalies of refraction than in anomalies of the light-sense. If in the latter the sensation of red or blue is more reduced, we may assume a disease of the light-conducting, or of the light-perceiving apparatus, whereas an even reduction of the light-sense indicates obscuration of the media.

With Wolffberg's apparatus I have examined 416 soldiers, 145 college boys, and 217 college girls,—in all 778 persons.

Before I speak of the results, I want to premise that as visual object for red a disc of red cloth of 2 *mm* in diameter —r^3—for blue a blue-cloth disc of 7 *mm* diameter—bl^7—on a black-velvet ground was used, and, corresponding to the above, 2 others r^7 and bl^{18}.

First the persons were examined as to their visual power without glasses, which I shall call S. I have entered into a table the values of *cFm* which I obtained for the different S_2 from $\frac{1}{6}$ to $\frac{1}{60}$ of the 778 persons. I found, for instance, that a person with S $\frac{1}{6}$ could recognize $r^3 bl^7$ at 9 *m*; 9 others with S $\frac{2}{6}$ one $r^3 bl^7$ at 9 *m*, 2 at 8, 2 at 7, and 4 at 6 *m*, all therefore farther than $5\frac{1}{2}$ *m*, the normal distance.

Furthermore, of 112 persons with S = $\frac{6}{6}$, r^3 and bl^7 were recognized by

13	at 7 *m*.	11	at 5 *m*.
19	" $6\frac{1}{2}$.	1	" $4\frac{3}{4}$.
39	" 6.	7	" $4\frac{1}{2}$.
17	" $5\frac{1}{2}$.	3	" 4.
		2	" $3\frac{1}{2}$.
88	at $5\frac{1}{2}$ or more.	24	less than $5\frac{1}{2}$.

This fact, that 21 % of persons with normal eyes had less *cFm* than $5\frac{1}{2}$, is indeed startling. Dr. HOOR, a trustworthy military surgeon, found even 50 %, and conse-

quently considers Wolffberg's method as unreliable. I shall speak of this fact later, mentioning here only that H and color-blindness play a certain part in it.

Instead of reproducing in tabular arrangement the results of my examinations, I have preferred to present them graphically (see tab. vi. and vii.). At the first glance it is apparent that the central maxima of color-perception, corresponding to the successive values of S_2—from $\frac{9}{9}$ to $\frac{1}{60}$,—do not present themselves in a small diagonal line, but in a broad stream; yet its direction shows that the *quantitative central color-perception is proportional to the acuteness of vision.* If it (*cFm*) is greater than the average, astigmatism and spasm of accommodation are present; if it is smaller, myopia exists, which can easily be verified by glasses. **We may, therefore, assume that a person has normal S, if he distinguishes r^3bl^7 at the distance of $5\frac{1}{2}$ metres. Thus it is evident that in this mode of examination we have a parallel method to the determination of S.** As to myopia, I have put side by side the corresponding values of M, r^3bl^3, and S_2 in the following table, but must mention that the values are only approximately correct, variations of 3° in the higher degrees of M and S_2 not being rare.

c Fm according to degrees of M:

M.	r^3b^7.	S_2.
0.25 D	5	$\frac{5}{6}$
0.5–0.75	$4\frac{1}{2}$	$\frac{6}{9}$
1–1.5	$3\frac{1}{2}$	$\frac{6}{12} - \frac{5}{12}$
2–2.5	$2\frac{3}{4}$	$\frac{6}{18} - \frac{6}{24}$
3–3.5	2	$\frac{6}{36} - \frac{6}{60}$
	r^7bl^{18}.	
4–4.5	4	$\frac{5}{60} - \frac{4}{60}$
5–5.5	$3\frac{1}{4}$	$\frac{4}{60} - \frac{3}{60}$
6–7	$2\frac{1}{2}$	$\frac{3}{60} - \frac{2}{60}$
8–10	2	$\frac{2}{60} - \frac{1}{60}$

If S is found much below its corresponding value of *cFm*, simulation is to be suspected, and in recruits this has often been demonstrated by me.

Quite a drawback, especially at the beginning, inherent to Wolffberg's method is the fact that *for the adequate values of* r^3 *and* bl^7, *as well as for* r^7 *and* bl^{11}, *different distances are found*, which seems to indicate that the relation between r^3 and bl^7 is incorrect. This difference was especially noticed in ametropic eyes, namely,

In astigmatism in 56 %,
" myopia " 47 %,
" hyperopia " 41 %.

The examination of myopic eyes in male and female educational institutions brought me to the remarkable observation, that for equal degrees of M the vision was less impaired in boys than in girls; the eyes of girls, therefore, should not be so much taxed as the eyes of boys. Among the deleterious consequences of over-taxing, diminution of the light-sense appeared earlier than diminution of visual sharpness. The examination for *cFm* is, therefore, a more delicate dynamometer than the examination of S, and should in school-children not be omitted.

Wolffberg's apparatus requires good daylight, and is, in this respect, inferior to other methods.

ON THE FORM OF THE ORBIT IN MYOPIA.

By OTTO COHEN, in Bonn.

(*With plate i., vol. xix., German edition.*)

Translated, abridged, by H. Knapp.

ON the suggestion of Prof. J. Stilling of Strasburg, I have made a series of investigations of the shape of the orbit in myopic and other persons. Stilling is of opinion that a constant pressure on the eyeball is exerted by the superior oblique and the inferior rectus muscles in near work, reading, writing, etc., favoring the growth of the eye in an antero-posterior direction. The object of my investigations has been to ascertain, whether or not myopia is connected with a peculiar form of the orbit, in which the sup. oblique must exert a greater pressure on the eyeball. A compression of the eyeball by the superior oblique can indeed be demonstrated in many, though not in all, cases on the dead body. Stilling has published his researches on this subject in his extensive monograph: Entstehung der Kurzsichtigkeit, Wiesbaden, 1887. The influence of the shape of the orbit is easily understood. If the orbit is low and consequently the trochlea deep, the tendon of the superior oblique will more or less lie on the globe and compress it, which is not the case when the orbit is high. With a pair of compasses I have, in conjunction with Dr. Stilling, determined the breadth and height of the orbit in a greater number of persons, and computed the relation of its height to its breadth—the latter put = 100. The pupils of a Strasburg college, 334 in number, were examined in this way. The results were as follows:

In 114 out of 134 myopic eyes, the above relation—called index, as in measurements of the cranium—varied between 71.4 and 85.7 ; whereas in the 200 emmetropic or hyperopic eyes, 166 had an index varying from 85.2 to 100.0. From this it follows indeed, that myopes have in general a lower orbit than emmetropes and hyperopes. I should not omit to mention, however, that Stilling as well as I has found myopic eyes in high orbits, a fact which cannot be explained in the above manner. Such cases are rare. Very frequently when one eye of the same person was myopic and the other E or H, we have found that the orbit of the myopic eye was flatter than that of its fellow. The pupils from Alsace showed a smaller percentage of M, than those from other, especially northern, parts of Germany. According to the investigations of Schwalbe, which Stilling could confirm, the Alsacians are distinguished by high orbits, whereas the inhabitants of northern Germany, by a considerable admixture of Sclavonian blood, show a high percentage of M, the same as the Russians according to Erismann and Maklakoff. The Russians, as a rule, have flat orbits. In order to ascertain whether the superior oblique in reality is likely to exert more pressure on the globe in low orbits than in high ones, I made, under Stilling's direction, careful dissections of 20 orbits of dead bodies. After the dimensions of the orbits had been determined as in the living, the roof of the orbit was chiselled away, the elevator of the upper lid removed and the superior oblique laid bare, and the conditions of the globe resulting from tractions of the muscles noticed.

1. L. E., height 32, breadth 35 ; index = 91.4.

(See fig. 1, plate i.) The superior obliqued escends steeply, passes over the globe almost in the median line. No trace of compression of the globe.

2. R. E., 33 : 35 ; I. = 94.2.

(Fig. 2.) The tendon of the superior oblique descends steeply and far, runs almost in the median line, nowhere applying to the globe. No compression whatever.

3. L. E., 30 : 35 ; I. = 85.7.

(Fig. 3.) Orbital margin strongly projecting ; eye placed

deep in orbit. Tend. of sup. oblique spreads fanlike over the posterior part of eye. Its contraction compresses the ball greatly, producing a transverse fold and increasing the lateral diameter of the globe.

4. R. E., 30 : 36. I. = 83.3.

(Fig. 4.) The tendon runs obliquely and lies extensively on the globe, which it strongly compresses, increasing the diameter which runs from behind and into, forward and out.

5. R. E., 29 : 35 ; I. = 85.2.

(Fig. 5.) Trochlea high ; insertion of muscle, broad ; globe compressed longitudinally, shortening its antero-post. diameter.

6. L. E., 31.5 : 34 ; I. = 92.3.

(Fig. 6.) Trochlea high ; tendon steep ; no compression of globe.

9. L. E., 36 : 38 ; I. = 94.7.

(Fig. 7.) Tendon very steep ; only a slight compression visible, shortening the longitudinal axis.

14. L. E., 30 : 35 ; I. = 85.7.

(Fig. 8.) Tendon obliquely over globe ; trochlea low ; compression of globe marked.

15. L. E., 30 : 34 ; I. = 83.3.

(Fig. 9.) Tendon runs very obliquely, almost transversely over the globe, which is compressed and shows a longitudinal fold. Eye deep in orbit.

16. L. E., 30 : 34 ; I. = 88.2.

(Fig. 10.) Trochlea anteriorly and high. Globe by compression shorter and broader.

17. L. E., 32 : 36 ; I. = 88.8.

(Fig. 11.) The globe is slightly compressed from in front back.

18. L. E., 31.5 : 36 ; I. 86.1.

(Fig. 12.) Trochlea high. Globe compressed almost transversely.

19. R. E., 23 : 29 ; I. = 79.3.

Child of 2 years (fig. 13). Trochlea low, lying on the globe to a great extent. Globe compressed transversely.

20. L. E., 25 : 30 ; I. = 83.3.

Child, 2 years (fig. 14). Tendon lying obliquely and extensively on globe. Globe compressed obliquely.

If it be permitted to draw conclusions from the above investigations, from those in the living and those in the dead body, we obtain the following results:

1. The form of the orbit influences the course and insertion of the superior oblique muscle.

2. In low orbits this muscle has such a course and insertion as to cause compression of the eyeball, and, consequently,

3. The form of the orbit influences the development of myopia.

ON THE POLYPOID TUMORS OF THE CONJUNCTIVA.

By Dr. ANTON ELSCHNIG, of Gratz.

(*With plate ii., vol. xix., German edition.*)

Translated by Dr. James A. Spalding, Portland, Maine.

ALMOST all the text-books of diseases of the eye speak of the rarity of polypi of the conjunctiva, and the majority of authors that I have consulted generally understand by the term polypus all benign, superficially smooth, or lobulated, or even cauliflower-like, more or less soft tumors, with a relatively thin pedicle, that rest upon the conjunctiva, all of which, however, may vary enormously in a microscopical point of view. Thus we may often find on microscopic examination a very loose meshwork of connective-tissue bundles, the interspaces of which are filled with a fluid intercellular substance, in which spindle-shaped cells are seen occasionally arranged in rows, and yet the surface of the tumor resembles mucous membrane.[1]

The collective name polypus, for all these different tumors, to which were often added those granulations accidentally observed after surgical incisions (tenotomy), or as a result of foreign bodies remaining for prolonged periods in the conjunctival sac,[2]—the name, I repeat, was well enough when there were at hand so few histological reports of such growths as to enable us to perfect any classification of

[1] Stellwag: *Die Ophthalmologie vom naturwiss. Standpunkte*, 1858, p. 877.
[2] Fabre: "Des polypes de la conjonctive," Paris, 1878, p. 22.

polypi of the conjunctiva. We were consequently satisfied to call them from their macroscopic appearance; nay, indeed in general pathology, the same term was employed to designate any tumor with a thin pedicle, in contradistinction to a "fungus," which had a broad pedicle and a flat surface. Still, we must not forget that this was only intended to distinguish the external appearance, which threw no light upon the inner structure.[1] Of course only genuine tumors, not tumor-like alterations (granulations) should be called by this name; and since Billroth[2] has drawn a sharp line of demarcation between the organoid tumor-polypus ("mucous polypus") and the other polypoid tumors (fibroma, sarcoma), and has satisfactorily characterized the former, and Eppinger[3] has done the same for those tumors of the larynx that have so far been described, it seems to me possible and even necessary to classify these tumors of the conjunctiva according to their pathological-anatomical basis.

The pathological anatomist now understands by the name polypus the pedunculated, projecting, hyperplastic proliferation of a strictly circumscribed locality of the mucous membrane throughout its entire thickness; in other words, of every one of the mucous-membrane elements.[4] Such polypi arise frequently enough from the mucous membrane of the nose, pharynx, intestines, uterus, etc., and owing to their consistence and external appearance may bear great resemblance to fibromata of the same mucous membranes, causing numerous errors nowadays as well as in the past. Thus we even believed that the polypoid tumors of the conjunctiva were genuine mucous polypi, which must of course resemble in structure those tumors that occur in the localities just cited,[5] but when we investigated from this point of view the cases so far published, we found, *that genuine polypi do not seem to spring from the conjunctiva at all, or at least, to be precise, no such cases have ever yet been observed or described.* The tumors that have been taken for

[1] Rindfleisch: "Lehrbuch d. path. Gewebelehre," 1871, p. 61; and Virchow: "Die krankhaften Geschwuelste," Bd. ii., p. 192.
[2] Billroth: *Allg. chir. Path. u. Therap.*, p. 868.
[3] Eppinger: "Klebs' Handbuch d. path. Anat.," 3 Lief.
[4] Eppinger, *l.c.*, p. 225; and Rindfleisch, *l.c.*, p. 327.
[5] Graefe-Saemisch: "Handbuch," Bd. iv., 2, part ii., p. 147.

polypi have been (with the exception of the above-mentioned granulation tumors) almost exclusively fibromata. Therefore, as I have lately had an opportunity of observing and examining a typical polypoid tumor of the conjunctiva, it seems a good opportunity to endeavor to clear up the obscurity that still envelops the question of "*polypi of the conjunctiva.*"

Karl, æt. 17. June 26, 1887. A vascular tumor superficially covered with pus, and about 1 *cm* long, projects between the outer commissure of the right eye. It hangs upon a thin pedicle, and arising from the upper fornix of the conjunctiva close to the connective tissue of the eyelid, presses the lid forward, everts it a little at the outer angle, and then passing out between the lids it pushes the lower lid downward ; conjunctiva near the pedicle very red and swollen ; globe normal ; the tumor arising without any known cause has already lasted six months. At times it has bled spontaneously, and so profusely that the patient expresses himself as saying that it has " bled quarts at a time."

June 26th.—Tumor abscissed with curved scissors ; profuse venous and arterial hemorrhage ; pressure bandage.

June 28th.—Bandage wet with blood ; the locality of the pedicle marked with a granulation ; conjunctiva hyperæmic ; position of lids normal, and the eyes close easily and without pain.

June 29th.—Discharged cured.

The extirpated growth is soft, pear-shaped, covered with reddish-yellow scraps of mucous membrane ; 2½ *cm* in length, and at its thickest portion 1 *cm* through. The short pedicle 3 *mm* thick extends into a lobulated tumor, the upper end of which, with its pointed summit, pushed itself up into the upper conjunctival fold, whilst the lower and larger segment pressed out between the lids. The tumor was placed in Mueller's fluid, and after hardening in alcohol and imbedding in celloidin, was cut into sections chiefly perpendicular to the long axis (parallel to the pedicle), whilst a few in the lowest portion of the tumor were made parallel to the longitudinal axis. The sections were tinted in hæmatoxylin and eosin, which give much more beautiful pictures than picro-carmine, alum-carmine, and vesuvin tinctures.

The microscopic relations were as follows:

Sections of the pedicle (parallel to its longitudinal axis) and the adjacent portion of the tumor show with weak powers a distinct longitudinal striation, which with higher powers resolves itself into parallel layers of spindle-shaped cells in a fibrous base, in which we see numerous vessels that have been divided longitudinally. The walls of the latter are thickened, and contain in their narrow lumen a few red and white blood-corpuscles. The spaces between these fibro-cellular-tissue layers are filled with leucocytes and a multitude of round and oval cells with large nuclei (young connective-tissue cells). When the fibrous tracts thin out a little, we see between them a few larger, elongated, or star-shaped cells, with granulated protoplasm and large, oval, pale nuclei, containing one or two nucleoli. These cells, which occasionally exhibit a beautiful and regular meshwork, line the fissures between the fibro-cellular tracts.

This structural tissue occupies the half of each section appertaining to the pedicle; in the other halves the fibro-cellular tracts spread asunder, assume simply a fibrous character, and unite side by side with one another, producing a radiated and irregular arrangement, which characterizes the original structure of the body of the tumor. Connective tissue fibres crossing in every direction, and innumerable blood-vessels which give to the tumor an almost cavernous appearance, enclose between them round and oval connective tissue cells which are especially arranged along and around the vessels.

The nearer we approach the surface of the tumor the more distinctly the connective-tissue fibres are pressed apart, and thinned out, and even unravelled, so that between them we see fissures which are filled with a minutely dotted substance tinted dull red throughout with eosin. In these, too, lie the vessels (almost all of them divided transversely in all these sections made parallel to the pedicle) and spindle-shaped cells, which complete a loose communication between the vessels and the adjacent foreshortened fibrous layers (fig. 1).

The portion lying directly beneath the stratified epithe-

lium which envelops the tumor exhibits abundant infiltration with exudation cells. The epithelium gives off at numerous points triangular processes with the point directed toward the centre of the tumor, and thus loans to it an indentated, almost mulberry-like, appearance, whilst the free surface of the epithelium itself is smooth, and does not show the least trace of papillary excrescences.

The picture of these sections passing through the pedicle repeats itself, with here and there slight modifications throughout the entire mass; the centre is occupied by numerous vessels that have been divided obliquely, are partly filled with red corpuscles, and from which smaller vessels, divided longitudinally, radiate into the periphery, where again the intervascular spaces are filled with young proliferating connective-tissue cells. The further we proceed toward the lower end of the larger portion of the tumor the larger do we find those spaces filled with the finely granular mass, and vessels with a few red blood-corpuscles.

The upper portion of the tumor, flattened and pointed, and attached to the fornix conjunctivæ, shows in its middle portion empty and narrow and thick-walled vessels, which are imbedded in a fibrous tissue thickly furnished with roundish and spindle-shaped cells, whilst the peripheral zone is abundantly infiltrated with pus-corpuscles, robbed of its epithelium, and covered with coagulated pus. The uppermost segment shows defective tinting of nuclei and much disintegration of tissue, and, furthermore, distinct coagulation necrosis produced by the defective nutrition resulting from pressure between the eyelids and the eyeball.

The epithelium is partially destroyed upon those portions of the tumor exposed to external influences, and its place is there occupied by a membrane $1\frac{1}{2}$ *mm* thick, made up of strata of a fibrinous beam-work with imprisoned, well-preserved pus cells and coagulated masses of blood, and extending over the healthy epithelium. Here and there in this hemorrhagic fibrinous exudation-membrane we see packages of micrococci, which are, however, nowhere visible within the tissue of the tumor itself. At the spots deprived

of epithelium the underlying tissue is to a certain depth so thickly infiltrated with exudation cells, and some of the vessels so filled with the same, that only with the greatest attention can we distinguish the tissue of the tumor from the underlying exudation masses. Further still, we find at spots adjacent to these portions which still possess an epithelium a fibrinous exudation or cellular infiltration beneath the same, especially in the lowest segment of the overhanging portion of the tumor.

Finally, the epithelium deserves consideration on account of its interesting condition; it varies throughout in thickness, consists in the deeper layers of irregular polygonal cells, whilst the superficial, flat epithelia look as if they were cornified; here and there in the overhanging portion of the tumor, where the underlying tissue is infiltrated, are bladder-like spaces in the epithelial envelope, over which the most superficial epithelial layers are extraordinarily distorted and filled with exudation cells (fig. 2).

The tumor therefore represents a softened and extremely vascular fibroma, in which as a result of traction upon the pedicle and pressure between the lid and lobe, circulatory disturbances have been excited, and have subsequently led to increased transudation and œdematous alteration of the tissue. Furthermore, the mechanical, thermic, chemical, and mycotic irritation had led to croupous inflammation and hemorrhages upon the surface, to cellular exudative infiltration of the epithelial covering, to inflammation of the underlying body of the tumor, and finally to superficial losses of substance.

Tumors of the conjunctiva that develop in polypoid form are:

1. **The soft fibroma** is only a particular form of tuberose fibroma of the conjunctiva, and the one most frequently observed. The same may be said of fibromata of the conjunctiva as of fibromata of other mucous membranes, *e. g.*, those of the larynx arising under precisely similar circumstances. As for the latter, Eppinger has shown[1] that they are noted for developing in the form of polypi; then

[1] *L. c.*, p. 190.

as a result of their situation and consistency (traction and pressure) œdematous alterations occur, and the more general, the more constant and enduring these are, so much the softer and almost gelatinous becomes the fibroma, so that in this condition it is often called a mucous polypus, or even a myxoma. For these reasons we need not be surprised if the same easy diagnostic error should often be made concerning soft fibromata of the conjunctiva, and that they have consequently been described as polypi of the conjunctiva.

I will now subjoin a brief summary of the literature of this sort of tumor so far as accessible, and then add a résumé of the other tumors that have been described as polypi of the conjunctiva:

1. Blasius[1] gives a rather imperfect description of a smooth, fleshy, red polypus as large as a cherry, which sprang from the conjunctiva of a boy of twelve and was removed operatively; it seems, however, to have relapsed.

2. Juengken[2] remarks that he has seen several cases of fleshy polypi of the conjunctiva; they invariably originated in the upper or lower fornix conjunctivæ; in one case the polypus, which rested in the external commissure and extended beneath a portion of the lower and upper lids, was so large as to push the eyeball inward and cover it largely.

3. Desmarres[3] describes three cases of the disease in question: in the first the polypus was as large as a small pear, hanging from the mucous membrane of the upper lid, flattened, pale, and soft, except in its centre, where it was rather firm; in the second case the tumor was smaller, hung from a thin pedicle near the caruncle, and covering the puncta caused profuse lachrymation; in the third case the polypus sprang from the bulbar conjunctiva near the external commissure, hung down over the lower lid, and required several cauterizations before it was finally removed.

4. Fano[4] observed in a lady of sixty-two a polypus arising from the upper fold in the left eye; it was nearly 3 *cm*

[1] Polyp der Conjunctiva, *v. Ammon's Zeitsch.*, 1834, p. 454.
[2] "Die Lehre von den Augenkrankheiten," 1842, p. 445.
[3] "Traité des maladies des yeux," 1855, tom. ii., p. 188.
[4] *Journ. d'Ocul. et de Chir.*, tom. i., p. 248.

across, very flat, convex toward the eyelid, and apparently attached to a broad pedicle; it was composed of a fibrillar, slightly granular fundamental tissue, with numerous embryonal cells, many vessels, and a pavement epithelium.

5. Arlt[1] saw, in a girl of twenty, a pedunculated tumor as large as a pea at the inner commissure, and often bleeding profusely. After division of the pedicle the stump had to be cauterized again and again with lapis divinus to stop the hemorrhage.

6. A similar case with regard to the profuse hemorrhage is reported by Seitz.[2] An official, aged thirty-five, awoke one morning to find his face covered with blood, and convinced himself by means of the mirror that the blood came from his left eye, which had always been sound. The hemorrhages from that time onward came on day after day on the least provocation, such as bending over, or making the slightest bodily exertion, so that the handkerchief had to be changed several times daily. It was only after five months that a polypus on the inner surface of the upper lid was discovered as the source of the hemorrhage; after the removal of the small, bean-shaped, flat tumor the hemorrhages ceased.

7. Fabre[3] mentions a case of a boy æt. eight, operated upon at Fano's clinique for left convergent strabismus, and who came again on account of a tumor beneath the upper lid of the operated eye; it consisted of two portions, was flattened, pushed backward, attached with a pedicle to the conjunctiva of the upper portion of the globe, just above the middle of the corneal margin, and resembled in form and appearance a mucous nasal polypus; duration of disease one month. Slight hemorrhage followed the removal. The tumor was composed of fibrous tissue covered with pavement epithelium and infiltrated with embryonal cells, small arteries, enormously enlarged veins; a small hemorrhagic focus. "The tumor," to quote Fabre's work, "is consequently a granulation or a fibroma, in the stage of development."

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[1] "Die Krankheiten des Auges," 1860, Bd. i., p. 166.
[2] "Handbuch d. gesammt. Augenheilk.," 1869, p. 90.
[3] *L.c.*, Case 1.

8. Saemisch[1] was treating a girl for moderate catarrhal conjunctivitis of the left eye; on everting the upper lid, which hung a little lower than that of the other eye, he saw a broad, flat, red, smooth tumor 6 *mm* long and 4 *mm* broad, arising with a very thin pedicle from the upper fold. After it was removed the conjunctivitis ceased.

9. v. Wecker[2] removed from the region of the caruncle a tumor about 1 *cm* long, which had come on slowly without causing any other symptoms; after it had reached a certain size, lachrymation began. No histological examination was made, and the tumor was called a polypus of the conjunctiva.

Two cases reported by Rampoldi and Stefanini[3] as angioma appear really to be soft fibromata, which had obtained the cavernous appearance mentioned by Billroth and and Eppinger, although an angioma at the advanced age of the patients in question is one of the greatest of rarities.

10. The first of these two ("angioma of the conjunctiva") was seen in a peasant of fifty, who had a small nine-pin-shaped, pedunculated, wine-colored tumor arising from the right upper fold. The microscope showed normal epithelium, fibrillar connective tissue in the centre of the tumor, numerous fissures lined with endothelium, partly empty, and partly filled with red corpuscles and hemorrhages.

11. The second case (angioma cavernosum) was that of a man of fifty-three, with a mulberry-like, coffee-colored tumor at the external canthus, and bleeding profusely to the touch; it had already been ligated by another surgeon but relapsed; normal epithelium, yet a cavernous tissue and a loose fibrillar connective tissue containing numerous leucocytes.

Jeaffreson[4] has described polypi of the conjunctiva, but his article is inaccessible to me, as well as that of Dubreuil.[5]

Diagnosis.—Soft fibromata of the conjunctiva are therefore pedunculated growths from the conjunctiva or subconjunctival cellular tissue, which in the majority of cases

[1] *L. c.*, p. 148.
[2] Fabre, *l. c.*, p. 14.
[3] *Annali di Ottal.*, 1884, p. 74.
[4] *Lancet*, 1873, vol. ii., p. 20. See Nagel, 1873, p. 248.
[5] Polype de la conjonctive, *Gaz. heb. sciences méd. de Montpelier*, 1884, p. 275.

arise from the conjunctiva of the lid, although they may spring from the bulbar conjunctiva or the semilunar fold. They are distinguished by their rapid growth, cause no trouble except from mechanical hindrance, or the occasionally profuse hemorrhage, which occurs without apparent cause, or on the slightest touch. They may attain great size. The hemorrhage, which was long since emphasized by Mackenzie[1] and Stellwag, is peculiar to the soft fibromata in comparison with all other connective-tissue tumors of the conjunctiva, and is pathognomonic in its significance. The size of the fibroma varies, according to the duration of the disease, between that of a bean or hazel-nut, whilst in rare cases they rapidly attain a growth of several centimetres.

There ought not to be any doubt about the differential diagnosis; the only tumor that can possibly be mistaken for the soft fibroma is a genuine polypus, but I still think that up to this time it has never been proved that mucous polypi can grow from the conjunctiva which is only mucomembranous in appearance. Therefore in such an eventuality the histological examination alone could confirm the diagnosis.

The prognosis is very favorable, because in every case so far reported, after a fundamental abscission which is the only rational *treatment*, the little wound heals without irritation and there is no relapse. It should, however, be mentioned that the hemorrhage from the pedicle may be profuse, but at the same time that by careful application of a close-fitting bandage it can easily be stopped. It is only in the rarest cases that the root of the pedicle has to be cauterized. The microscope invariably shows a loose fibrillar basis substance, with numerous young connective-tissue cells, a large number of dilated vessels, and a covering of pavement epithelium with several strata. The tissue has almost invariably been infiltrated with pus cells, which is to be referred to the inflammatory alterations of the tumor.

II. A second group of polypoid tumors is that of the **hard tuberose fibromata,** which are more frequently situated on the conjunctiva of the lid and the caruncle than

[1] French edition, 1856, vol. i., p. 371.

elsewhere, and are generally of a hard or cartilaginous consistency; they grow as large as a bean or hazel-nut, and do not cause any particular disturbance except when by their size they prevent the lids from closing, or by pushing aside the lachrymal puncta they interfere with the escape of tears. They rarely relapse after removal. They exhibit a fibromatous structure (connective tissue with more or less abundant vessels), and are generally enveloped with a normal conjunctiva.

Mackenzie,[1] who speaks of polypi of the conjunctiva separate from those of the caruncle, also distinguishes those arising from the caruncle into soft, easily bleeding caruncular tumors with a pedicle, and harder tumors sprouting from the semilunar fold or caruncle. In the same way Desmarres[2] refers to the benign tumors arising from the caruncle as *encanthis polypeuse*, but otherwise agrees with Mackenzie's classification. Seitz,[3] on the contrary, gives the general title of *encanthis polyposa* to all benignant neoplasms arising in this region.

Such fibromata are not at all uncommon; thus Lawrence[4] describes a "polypus" of the conjunctiva, which was smooth, covered with mucous membrane, clung closely to the tarsal conjunctiva of the upper lid, with a very firm pedicle, and showed a hard and fibro-cartilaginous interior structure.

Additionally Stellwag[5] has published two cases, in the former of which the fleshy tumor as large as a bean was connected with the subcutaneous connective tissue of the lower lid by a very firm, tendinous pedicle; the surface was nodulated, as if covered with trachoma granules; internally there were numerous elastic fibres, no vessels, and an envelope of pavement epithelium. In the second case, at the same situation, only smaller in size, the tumor was enveloped in normal epithelium, and was composed of normal connective tissue, with numerous vessels and abundant ramifications.

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[1] *L. c.*, p. 371.
[2] "Maladies des yeux," 1847, p. 851.
[3] *L. c.*, p. 98.
[4] "Traité des maladies des yeux," Paris, 1884.
[5] *L. c.*, p. 996.

v. Graefe[1] describes a fibroma at the caruncle (hazel-nut-size tumor supported by a thick connective-tissue pedicle, and covered with mucous membrane; interior, homogeneous, loose, rather fibrous, with elongated nuclei and spindle-shaped cells), and v. Wecker,[2] a cystic fibro-sarcoma, or a cystic fibroma in the developmental stage (6 *mm* in diameter, round, and pedunculated, slow in growth; fibrous mass covered with stratified pavement epithelium; numerous enlarged vessels and veins, lymphoid infiltration, and cysts, lined with goblet-cell epithelium).

III. A small number of polypoid tumors generally called polypi or warts of the conjunctiva must next be mentioned under the true title of **papillomata.** Mackenzie characterizes them as red, fleshy, slightly granular warts which frequently relapse after removal, and only disappear after complete cicatrization of the corresponding portion of the conjunctiva. These vegetations, which according to Travers may be compared with condylomata of the prepuce, must not be confounded with the fungosities that are often developed around foreign bodies remaining for a long time in the conjunctival folds. Saemisch[3] separates the papillary fibromata from the warty formations of the conjunctiva, although the difference between them is purely external; papillomata here as elsewhere may be either warty or villous, or puffed in appearance. In the former case, we have raspberry-like and coarse tumors, whilst the latter resemble the so-called condylomata occurring elsewhere. The histological structure is very simple, the papilloma consisting of a connective-tissue excrescence with axial, capillary network and epithelium; in the verrucose form, the epithelium predominates, and has several strata; in the villous form the epithelium is extremely delicate.[4]

Papillomata are due to chronic inflammatory alterations in the conjunctiva; they do not excite any special effect, yet we should notice their great tendency to relapse, shooting up repeatedly at or near where they have been abscissed.

[1] *Archives*, Bd. i., Abth. 1., p. 280.
[2] *Cf.* Fabre: *l. c.*, p. 9.
[3] *L. c.*, p. 152.
[4] Eppinger: *l. c.*, p. 186.

They should always be snipped off, and the base scraped and cauterized with lapis. At this point we may as well refer to Mackenzie's[1] cases, in which, after removal of a small papilloma of the external surface of the lower lid, several others appeared on the conjunctiva of the globe, and to those of Arlt, in which the cauliflower-like, pale-red, delicately warty, and raspberry-like granulations rested on the inner canthus, yet after removal and cauterization of the base with silver nitrate and copper sulphate they relapsed again and again, through a period of eighteen months, until the entire conjunctiva at the inner canthus looked smooth and tanned.

Here, too, we may mention a case of Kanka's[2] in which there rested on the margin of both upper lids, close to the conjunctiva, small pale tumors as large as a raspberry, and which on removal were found to consist of cellular tissue and numerous vessels; furthermore, a case of v. Wecker[3] with a series of small excrescences at the margin of the semilunar fold, and near a conjunctival polypus that had existed for years; there was no relapse, after removal and cauterization with lapis. The same author operated on a young man who had long suffered from a pedicled tumor near the upper punctum; the growth was 8 *mm* long, 5 *mm* broad, pale red, with a warty surface. The microscope showed hypertrophic conjunctival papillæ; fibro-cellular tissue, with lymphoid cells, and covered with a thick layer of epithelial, cells the inner layer of which had preserved their polygonal form. Horner[4] describes an interesting case, in which the microscope showed papillary fibroma. The upper half of the right cornea of a man of sixty-two was covered with a soft reddish tumor, arising from the conjunctiva, 2 *mm* above the upper corneal margin. The surface was lobulated, and resembled a raspberry-like condylomata.

The case reported by Hirschberg[5] is typical in its exterior and histological structure; the patient, a boy of four,

[1] *L. c.*, p. 357.
[2] *Prager Vierteljahrsch.*, 1853, Bd. iv.
[3] *Cf.* Fabre, p. 13; and v. Wecker, "Traité d'ophthal.," tom. i, p. 463.
[4] *K. M. f. A.*, 1871, p. 8.
[5] *C. f. A.*, 1884, p. 200.

had on the caruncle a raspberry-like, pale-red neoplasm, two similar ones on the free margin of the lower lid, and on the bulbar conjunctiva a flat, reddish, and slightly raspberry-like tumor. Similar growths sprang from the upper tarsal conjunctiva, one on that of the lower lid, and finally two others on the lower fold. The eye was free from irritation, and the successive removal of the neoplasms was satisfactory. The histological examination showed circumscribed hyperplastic proliferation of the connective tissue, with hyperplasia in the overlying epithelium; the tumors were evidently fibromatous papillomata.

In conclusion, I would add that sarcomata also originate in the conjunctiva of the lid, develop in polypoid form, and consequently in many cases render the diagnosis difficult.[1]

[1] Talko: Sarcoma conjunctivæ palpebræ superioris, *K. M. f. A.*, 1873, p. 326.

ENOPHTHALMUS TRAUMATICUS.

By Dr. C. GESSNER.

ASSISTANT SURGEON TO DR. NIEDEN'S OPHTHALMIC CLINIC IN BOCHUM, PRUSSIA.

(*With one illustration.*)

Translated by A. H. Knapp, A.B.

ALTHOUGH the condition of the disease called exophthalmus, with reference to its disturbances and manifold etiology, has received sufficient attention in literature, of its contrary condition, enophthalmus, only a few cases have been noticed and placed on record.

Apart from the enophthalmus occurring in cholera, which v. Graefe[1] described, each of the following authors has published one case: Del Monte,[2] v. Becker,[3] Littenneuer,[4] Byornstrom,[5] Bærwinkel,[6] and Nieden.[7]

Under such circumstances it may be justifiable to describe three cases of enophthalmus of traumatic origin. I am greatly indebted to Dr. Nieden for the permission to communicate them.

Case 1.—A miner, Lissenfeld by name, nine months ago had the misfortune of being knocked down by a falling mass of coal. He was thrown with his face against the edge of a stone, and became unconscious. His right upper jaw and zygomatic bone

[1] *Arch. f. Ophth.*, Bd. xii., 2, S. 200.
[2] Osservazione e note cliniche, 1871, S. 71.
[3] *Arch. f. Ophth.*, Bd. xii., 2, S. 289.
[4] *Gaz. des. hôp.*, 1873, S. 243.
[5] Fall af vasomotorisk Enophthalmus. *Upsala läkaref*ör, 1875, Bd. x., S. 378.
[6] *Deutsch. Arch. f. klin. Med.*, 1874, S. 445; und Berger, *Virchow's Arch.*, Bd. lix., S. 319.
[7] *Klin. Monatsbl. f. Augenheilk.*, 1881, Februar.

were fractured, and the superior orbital margin was injured. After having kept his bed for ten days, when the swelling of the eyelids was sufficiently reduced to permit the opening of the right eye, he and the people around him noticed, to their great astonishment, "*that the right eye now was smaller than the left.*"

At this point I should like to draw attention to a phenomenon which appeared in each of the three cases, and

which was first mentioned by Nieden, *i. e.*, that the eyeball in enophthalmus has the appearance of an artificial eye. The accompanying wood-cut (for which I am indebted to Dr. Nieden) may serve to illustrate the rather rare affection under consideration.

A scar, the result of the above-mentioned injury, not adherent to the bone, is on the margo supraorbitalis dexter, extending from the incisura supraorbitalis to the outer corner of the eye. The eyelids are sunken in around the retracted globe. The upper palpebral fold is smoothed, the upper lid depressed. The distance between the outer and inner lid angles is 2 *mm* smaller than

on the left, which may have been caused only by the deeper position of the globe on account of the diminution of the tension and pressure exerted from the eyeball on the lids. The upper lid cannot be raised above the upper edge of the pupil. The movements of the globe are somewhat impeded upwards, but slightly increased downwards; in the other directions they are normal but sluggish. The right globe itself lies about 3 *mm* deeper than the left. The keratoscopic picture shows no abnormity. The interior of the eye is normal. $S = \frac{3}{4} - \frac{3}{3}$. The binocular act of vision is unchanged. Pressure on the region of the trochlea produces quite intense pain.

Case 2.—In the mines, about a year and a half ago, a large mass of coal struck a miner, Rüssing by name, on the forehead, and he fell down insensible. The right orbital region and the eyelids were swelled. In two weeks, when he was again able to open his eyes, he noticed that "*the right eye was smaller than the left.*" which induced him to come to the clinic.

The deeper position of the right eye is conspicuous. We discovered, as a remnant of the injury, a non-adherent scar on the right edge of the supraorbital margin, extending from the incisura supraorbitalis to the outer lid corner. The orbit is not tender to the touch. The upper lid is sunk back into the orbit. The palpebral fissure is smaller than on the left side. The lids move normally. The globe moves up a little less, down a little more, than normal. The interior of the eye is healthy.

On the outer edge of the optic disc there are three shining whitish-gray prominences, globular bodies of the hyaloid membrane of the choroid. The keratoscopic picture shows no abnormity. The vision is reduced to $\frac{1}{3}$. The patient alleges that he formerly could see quite well with the right eye, and considers the injury as the cause of the impairment of his sight; but this is questionable.

Case 3.—In 1882, a miner, called Dowe, was struck down by a mass of coal, and fell unconscious with his face against a heap of coals. He experienced the same consequences as the two patients just described. He also was confined to his bed for three weeks. The front and orbital region was swollen, and the right eye was closed. He could not open the right eye until the fourteenth day, when he noticed that it was smaller than the left. We discovered an adherent scar, the result of the injury, on the upper edge of the right orbit and extending from the incisura supraorbitalis to the nasal process of the frontal bone.

The accompanying figure shows that the upper lid was deeply drawn into the orbit, but in no way adherent; also that the fold of the lid was absent. The lower lid was hollowed out in the form of a trough, but not so extensively. The upper lid droops. The breadth and height of the palpebral fissure are reduced. The lids close well. The globe does not move fully up and out. The orbit can be examined by palpation much further than normal and without pain. The ophthalmoscopic examination was normal. The binocular vision is disturbed by the presence of homonymous diplopia on the right side. S = $\frac{3}{4}$ in each eye. The sinking in of the right eye was estimated to be 3–4 *mm*.

To the preceding brief account of the three cases I beg leave to add some remarks on the genesis and the disturbances of mobility connected with enophthalmus. The presence of microphthalmus can be excluded on account of the equality of the cornea, the refraction and also, in two cases, the acuteness of sight in both eyes.

Nieden thinks that in his case the enophthalmus was produced by atrophy of the retrobulbar tissue, owing to strong and prolonged compression. Without rejecting his explanation I am inclined, on account of the presence of a cicatrix at the orbital margin in all of my cases, to look upon the orbital injury as the cause of the enophthalmus. Experience teaches that contused wounds of the orbital margin usually involve the periosteum and the bone, and the subsequent inflammatory reactions are readily propagated to the orbital cellular tissue.

The question arises: Are we justified or even forced to consider the enophthalmus as a consequence of the retraction of the eyeball, and the disturbance of mobility of the globe as an inflammatory process of the muscles, *i. e.*, a connection of the globe with Tenon's capsule, and at the same time of the muscles? I think not.

In my opinion, *the enophthalmus is produced by the mechanical falling back of the globe into the orbital cavity, the contents of which have been reduced by cicatricial contraction of the retrobulbar cellular tissue. It may be aided by a certain pressure from the lids.*

An inflammatory participation of the ocular muscles is im-

probable, on account of the absence of disturbances of mobility. The insufficiency of the abducens in the case of Dowe, and the sluggishness in some other muscles, may be explained by a certain laxity of the muscles, on account of the deeper position of the eye.

ON THE QUESTION OF ACCOMMODATION OF THE APHAKIAL EYE.

By DR. PAUL SILEX.

ASSISTANT SURGEON OPHTHALMIC CLINIC, UNIVERSITY OF BERLIN.

Translated by H. KNAPP.

ALTHOUGH on the strength of Donders'[1] and Helmholtz's[2] exact demonstrations the proposition, the aphakial eye possesses no accommodation, has penetrated into *succum et sanguinem* of every ophthalmologist, yet occasionally observations made in practice awaken in the mind of the one or the other some doubts as to the correctness of this dogma; evidence, the papers by Förster[3] and Schneller.[4] In the Berlin Eye Clinic, also, some cases occurred that induced us to give this subject a careful consideration.

The signs of apparent accommodative power in aphakial eyes have been noticed only in young persons, up to 25 years. Older ones sometimes read tolerably well with their distance glasses, but only when throwing their heads back and looking obliquely through the edge of the glass, which procedure makes the glass stronger.

The patient who induced us to study this question more particularly was a boy of 14 years, whose cataract had in 1882 been successfully removed by repeated divisions. In 1887 the right eye had a clear, round, freely movable pupil.

[1] "Anomalies of Refr. and Accom."
[2] "Physiolog. Optics," 1st ed., p. 49.
[3] Accommodation in Aphakia, *Zeh. kl. Mon.*, 1872.
[4] *v. Gräfe's Arch.*, xxxii., p. 313, etc.

With $+\frac{1}{3\frac{1}{4}}$ S $= \frac{6}{18}$—$\frac{6}{12}$. With the same glass he read Schw. 0.4 at 20 *cm* (8″), looking straight forward. With all other glasses he alleges to see worse, yet with — 24 added to his $\frac{1}{3\frac{1}{4}}$, and with $+\frac{1}{3}$ his S remains $\frac{6}{18}$. We made the following experiment. The patient had to look through a tube of 10 *cm* in length and 1 *cm* in width, at the (proximal) end of which a $+\frac{1}{3\frac{1}{4}}$ was fastened. Such a tube has no stenopäic effects, as I have convinced myself by personal experiments. His pupil was slightly dilated with cocaine, and the eyelids were kept apart by a speculum. With $+\frac{1}{3\frac{1}{4}}$ his S was $\frac{6}{18}$ to $\frac{6}{12}$, and he recognized with the same glass, looking in the same manner through the tube, 0.6 at 20—30*cm* and 0.5 at 25*cm*, with some mistakes, whereas 0.4 was no longer seen distinctly.

This was the most decisive case of all that have come before us. We have been able readily to unmask the others by finding out that they moved their heads back, or narrowed their palpebral fissures, or looked through the edge of the glass. I shall, therefore, say nothing about those cases, nor discuss the incident literature collected in "Graefe-Sämisch's Handbuch"[1] where all the *pros* and *cons* of this question may be found. I shall only refer to the paper of DONDERS[2] in which he says: "Only when it is demonstrated that the visual acuteness remains the same within a certain interval, there can be question of accommodation." Our patient met this condition. His

distant S was - -	$\frac{6}{12} = \frac{1}{2}$
near S was - -	$\frac{0{:}5}{0{:}25} = \frac{1}{2}$

He also gave a positive result on an experiment which Donders describes in his paper: "When an eye without accommodation is accurately adjusted to a distant point of light, it sees it as a circle. Accommodative efforts will, on account of narrowing of the pupil, diminish the size of the circle, but not change its shape, whereas the shape will be changed when a weak + or — glass, $\frac{1}{200}$, is held before the eye. From our patient, when putting glasses before his eyes, we obtained only contradictory answers, not so when

[1] Vol. v., p. 444.
[2] *v. Gräfe's Arch.*, xix., p. 63.

I let him look at the point of intersection of two fine threads situated near by, but in the visual line of the distant point of light. He said the luminous little disc was converted into a vertical oval. Our patient satisfied both requisites of Donders. Question: How to explain it? A possible change of curvature of the anterior surface of the vitreous, produced by the contraction of the ciliary muscle, cannot have, as *Woinow* points out, any appreciable optical effect, the refractive powers of aqueous and vitreous being almost equal.

SCHNELLER thought to have proven that in binocular vision the interior accommodation of the eye is increased by an exterior one, owing to lengthening of the globe.

SATTLER,[1] by exact methods of examination, has demonstrated that, for the normal eye, this is not so.

For the aphakial eye I thought evidence might be furnished by the ophthalmometer. If Schneller's proposition were correct, the globe could not lengthen without some change occurring in the curvature of the cornea. With the kind assistance of Dr. König, I subjected the patient to ophthalmometric measurements at the Physiological Institute of Berlin. The patient kept his spectacles on, as without them his fixation would have been unsteady. He had to look alternately at the tube of the instrument and at small printed pieces of paper held at reading distance from his eye a little down and in. In spite of the eighteen reflection images of the lamps, it was easy to distinguish those belonging to the cornea. The pupil contracted on convergence, the boy alleged to recognize the letters clearly, but the relative position of the images did not change.

We therefore had no doubt any longer but that the aphakial eye was devoid of accommodation. Our patient's ability to satisfy the two conditions of Donders may be explained by the probability of some error of observation having crept in at the previous examinations—a supposition partially verified later on,—and by the unusual faculty of certain ametropes to overcome dispersion circles, *i. e.*, to recognize fine objects for which they are very insufficiently accommodated.

[1] Trans. Heid. Ophthal. Soc., 1887.

TWO CASES OF DETACHMENT OF THE CHOROID (APPARENT CHOROIDAL TUMOR) AFTER CATARACT EXTRACTION; SPONTANEOUS RECOVERY.

By Dr. A. GROENOUW, of Breslau.

Translated by Dr. J. A. Spalding, Portland, Me.

THE extreme rarity of choroidal detachment and the fact that no recovery from the disease has ever yet been reported induce me to publish two cases.

Christiana H. æt. 63, was successfully operated upon for a Morgagnian cataract of the left eye, by the peripheral linear section, June 22, 1887; S ½. Five months later she came for an operation on the right eye, which had been blind for twelve years.

Morgagnian cataract with extensive opacification of the anterior capsule and liquefaction of the milky white cortex; candle recognized at twenty feet, and V. F. perfect.

When extraction was attempted the capsulotome and forceps slipped off of the capsule, and it was not till after repeated introductions of the forceps that the lens was extracted in its capsule without the loss of vitreous. Recovery good, and a fortnight later the incision had united firmly, the coloboma was transparent, and the optic papilla distinctly visible. The lower and inner quadrant of the fundus showed an orange-yellow choroidal tumor, with retinal vessels running over the marbly surface, and of so great an extent that it was visible even by lateral illumination with atropine mydriasis. Retina not detached. T normal, *not minus*. With + 3½ S 20–200; V. F. contracted about twenty degrees over the affected portion, in comparison with the normal V. F. in the other eye. Five days later patient was discharged with the warning that an enucleation might be necessary.

Seven weeks later she returned, but of the apparent tumor there was not the least trace ; its former locality was distinguished by an irregular pigmentation of the fundus, which, however, was present everywhere else, so that it could hardly be regarded as pathological. S with + 4, cyl. + 20, axis 180° 20–70, and V. F. normal.

Several skilful ophthalmoscopists repeatedly examined the patient, so that it can hardly be said that the mistaken diagnosis of choroidal tumor was due to reflection of light.

Professor Foerster has been so kind as to give me the following notes of a case in which three years before an intraocular tumor had as suddenly disappeared.

A man of 64 had had his right eye operated on for a hypermature cataract ; the eye had never been capable of reading, and thirty years before Burow had diagnosticated an internal disease of some sort. The inner side of the visual field was defective ; the cataract was very white, and the capsule had a large whitish opacity.

Extraction January 10, 1885, with peripheral linear incision and iridectomy. On attempting to open the capsule with the toothed forceps the lens followed in its unbroken capsule ; no loss of vitreous ; recovery perfect.

January 30th ; injection has disappeared, pupillary margin free, pupillary field clear ; iris non-adherent to cicatrix ; optic papilla rather indistinct owing to slimy vitreous opacities ; a yellowish-red tumor projects into the vitreous ; near the macula a large white spot, with black pigment around it. With + 2½ Snellen X deciphered.

Three days later the tumor was about 4 P. D. from the macula ; *a fortnight later no trace of the tumor was visible.*

It is plain that these were not tumors at all, but probably hemorrhagic extravasations excited by the extraction and lying between the choroid and sclera, bulging forward the retina and choroid, and simulating a tumor. But there was not even a simple detachment of the retina without a simultaneous detachment of the choroid, because the immobility of the tumor, the absence of varicose vessels, and of any sort of elevations or folds upon the surface, and

In order to incite the reader to experiment for himself, this sheet, covered with a reading test, has been arranged so as to be removed from the binding.

-8271- Gesucht.

Wo eine junge, gente Tochter, die das nähen erlernt hat, die schneiderei gründlich erlernen? Gefl. Offerten Chiffre N. B. 528 ins Berichthaus.

-8274- Gesucht.

Zwei Schreiner. Nr. 77, im Hof, Kreuzplatz.

-5188- Gesucht.

Für eine Tochter, deutsch und sprechend, im B guter Zeugnisse, Stelle in einem Laden biel welcher Branche. Off unter Chiffre 1381 ins Berichthaus.

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-8271- Gesucht.

Wo könnte junge, intelli Tochter, die das Weisz erlernt hat, die Damen gründlich erlernen? Gefl. Offerten unter N. B. Nr. 1 ins Berichthaus.

-8274- Gesucht.

Zwei Schreiner. Zeltweg im Hof, Kreuzplatz.

-5188- Gesucht.

Für eine hiesige deutsch und französisch sprechend, esitze guter Zeugnisse, eine Stelle in einem Laden gleich welcher Branche. erten unter Chiffre A. R. Nr. ins Berichthaus.

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The words, printed in broad-faced type, can be most easily combined binocularly, and serve for the first investigation to discover if the prisms have been correctly chosen.

above all the shimmering choroidal pigment necessarily diagnosticated a choroidal detachment.

Both cases bear a great similarity to each other; in both, the cataract was hypermature, and the capsule so opaque and so tough that the lens was extracted in the unbroken capsule.

Two similar cases have been reported by Knapp and Reuling[1] in which after extraction with excessive loss of vitreous (in Reuling's case the lens was extracted in the unbroken capsule) a detachment of the choroid was observed. Both cases (of which only Knapp's was diagnosticated during life) were unsuccessful, since in one the eye was enucleated for a supposed sarcoma of the choroid, whilst in the other the patient died of an intercurrent disease soon after the operation. The autopsy showed in the latter a total detachment of the choroid from the sclera by a serous effusion.

The cause of the detachment is to be sought in the vacuum following the sudden extraction of the lens (Reuling), yet some further disease of the choroid is necessary. For H. de Gouvea[2] has proved experimentally on dogs, that detachment of the vitreous and retina first follows the escape of a large amount of vitreous, secondarily ensues a choroidal detachment, whilst further, despite the enormous number of extractions with loss of vitreous, a detachment of the choroid is rarely observed. Some special predisposition for this form of detachment must exist before a, perhaps but slight, reduction of the intraocular tension (in the two cases on which this paper is based there was no loss of vitreous) suffices to produce a solution of continuity of the choroid, covered with the normal retina, from the sclera.

The first case illustrated this distinctly, since the extraction on the first eye, affected but a short time with cataract, but otherwise normal, went off successfully, whilst the other eye, blind with cataract for twelve years, and excluded from the act of vision, and consequently abnormal, ex-

[1] These ARCHIVES, vol. i., p. 439.
[2] *v. Graefe's Archiv*, Bd. xv., i., p. 244.

hibited the disease in question. In the second case the eye had been suffering for thirty years with choroiditis at the macula.

The cases teach us that in intraocular tumors we should always bear in mind, before urging enucleation, the possibility of a circumscribed detachment of the choroid, which may under favorable circumstances recover within two weeks.

The diagnosis between tumor and detachment of the choroid can only be accurately made by following the case for some time, since the chief symptom of detachment, the excessive reduction in the tension, was lacking in one case, and upon the tumor itself nothing suspicious was perceived despite a careful investigation.

ON FOREIGN BODIES IN THE CORNEA.

By Dr. C. RITTER, of Bremervoerde.

Translated by Dr. J. A. Spalding, Portland, Me.

I HAVE for many years paid special attention to foreign bodies remaining in the cornea for any considerable length of time. The agricultural occupation of our inhabitants and their low educational condition sufficiently account for the fact that bits of grain or turf or the wings of insects remain in the cornea or conjunctiva for a long time after they have entered the eye as foreign bodies. They are hurled in with great velocity during threshing or turf cutting, and with their sharp angles attach themselves forcibly to the point upon which they have impinged. Hence it is only that portion of the eye which remains uncovered whilst the eyelids are opened that is exposed to their action.

These foreign bodies cling to the cornea with great obstinacy; patients do not generally come to the physician for two or three weeks afterwards, and I have seen one case in which such an intruder had remained six months upon the surface of the cornea. The patients are not generally aware of the trouble; whilst working something has made the eye sore, but they have no suspicion of a foreign body in the eye. The diagnosis is usually easy: a circumscribed white or black substance rests somewhere on the cornea, or, more rarely, on the conjunctiva; rarely is it so small and so insufficiently set off against the background as to require artificial lateral illumination to reveal it.

Now and then a few reddish vessels run toward it from the adjacent corneal margin. The adjoining tissue is invariably transparent, unless vascular development has set in around the offensive material.

Beards of buckwheat are the most frequently observed foreign bodies. They consist of a brown scale and a trifle of the white kernel. Amongst the rarities are fragments of rye or wheat, then various grains, bits of stalks, and turf, and the wings of insects. I very rarely meet with chips of iron that have sprung off whilst a horse is being shod. This scale of frequency is, of course, of but local significance, and yet it is important from the point of view in which I am studying it.

What is the condition of these foreign bodies on the cornea? They form an important middle link between foreign bodies that are plunged into the skin and remain there, and those which have been implanted into the cavities of the body. They lie with one half exposed to the free air, whilst during sleep they are entirely enclosed in the conjunctival sac, where they lie surrounded with tears and the conjunctival secretions.

The most important question in regard to foreign bodies in the cornea is the depth to which they penetrate; the diagnostic partition wall is Bowman's membrane. When the foreign body penetrates into the fibrillar corneal tissue, in other words, passes through Bowman's membrane, then the cornea is always opacified, new vessels extend out to the foreign body, or pus is formed. Pieces of iron, grains of various sorts, or spears of grass are the foreign bodies that generally penetrate to so great a depth, and these have particularly attracted my attention since the appearance of Baumgarten's beautiful work[1] on corneal tuberculosis. Baumgarten agrees entirely with Cohnheim's ingenious hypothesis, and asserts that the lymph corpuscles of the corneal tubercle are swept in from the conjunctival sac. But for the very reason that I have only seen pus-corpuscles on foreign bodies that had penetrated into the fibrillæ of the cornea, and never on such as merely lay in the epithe-

[1] *Archiv f. klin. Med.*, Bd. xi., Nos. 1 and 2.

lium, I must assert myself as plainly opposed to that hypothesis, whose very boldness cannot conceal its falsity. These foreign bodies that have penetrated into the corneal fibrillæ are almost entirely surrounded by pus corpuscles, and it is by these very corpuscles that they are finally loosened from their firm situation. If we then examine the foreign body and the pus, we find a row of cocci and bacilli, which I will not describe at this point, as such description would simply cover that of the micro-organisms which are found on foreign bodies superficially situated. Nevertheless the pus-producing cocci must here be mentioned, and all the more since it is only of the superficially located foreign bodies that I have a sufficient supply of specimens.

Now those bodies that do not penetrate Bowman's membrane remain attached to the strata of the epithelium, push them apart, and cling with their sharp corners, like bits of turf and barbs of grain. The union of the epithelium and the foreign body is moderately firm, since repeated winking for months may not quite loosen it, but occasionally it is very slight, since the merest touch of a discission needle is sufficient to break it. If the substance remains very long we see little folds of epithelium rise up over its margins, so that it lies in a sort of furrow. We never fail to observe irregular proliferation and dislocation of the epithelium around the foreign body. After the latter is removed we see in its former situation in the upper epithelial strata a corresponding excavation, which after a few days entirely disappears.

There is no doubt that sooner or later, either by a powerful motion of the lids or some other force, every foreign body would be removed from the cornea without surgical intervention, for it never for any length of time clings with extreme tenacity to the epithelium; on the contrary, the union between the two grows looser every day.

The inquiry next arose in regard to the mutual action of the foreign body and epithelium upon one another, and whether there was an unknown third member. The very first investigation *revealed the presence of micro-organisms*,

and an accurate research into their presence and action is the chief purpose of this paper.

Pieces of turf and insects' wings, and scales of grain, suffer no change from impaction into the cornea, and the portions remaining uncovered do not change much, if any, in external appearance.

In searching for micro-organisms, we must reflect that pathogenic micro-organisms are not to be expected; they may originate from the conjunctival sac, or be brought in by the foreign body. Further, we asked whether certain forms are regularly observed—*i. e.*, whether they would become pathogenic under altered circumstances. The thermometer in the conjunctival sac measured 37° C.; applied to the cornea, 33.5°. Bacteria can flourish at these temperatures. The ground consists of the corneal epithelium and the conjunctival and lachrymal secretions. The chemical composition of this mixture and the temperature are therefore favorable for the growth of saprophytic and parasitic bacteria.

The foreign bodies, removed with a needle which had been sterilized in 5 % carbolic acid, were placed on a platinum wire, passed into liquid gelatine, and finally spread on the plate (Koch's method). The bacteria from the adult colonies were grown in bouillon, and isolated on hollow object-holders; from these, cultures were made; and lastly, potatoes and gelatine strips on object-holders were inoculated. I also grafted some of the bacteria into flat corneal flaps in rabbits, and thus tested their behavior toward the living corneal substance. The final result of these very laborious studies, extending over three years, is very slight. The longer I studied the oftener I found upon foreign bodies in the cornea the very same micro-organisms known to inhabit the ground and its submerging fluids.

The *root bacillus* is very frequent; its growth, like a nerve plexus, is so characteristic that it cannot be mistaken. It liquefies the gelatine along the rapidly growing fibres, and sprouts rapidly over a greater portion of the plate. In hollow object-holders, it grows out to long, stiff fibres, which, on attaining a certain length, begin to twist around.

In the puncture canal there is soon formed a funnel with excessive opacification, and on the twentieth day the liquefying funnel formation has reached the lowermost portion of the grafting puncture. Then there lies on the surface a thick covering, and on the bottom a plug, between them a clear stratum. Upon the potato there grows an even white mass, with a few little elevations. The potato bacilli are much smaller than those that grow on gelatine and in the bouillon. The potatoes remain white. After grafting upon the cornea, the root bacillus sometimes looks like an opacity in the superficial layers (twice out of three cases), which disappears in from four to ten days. One cornea thus opacified was hardened in alcohol, and examined by Gramm's method, but no root bacilli were found, nor did any grow upon a gelatine plate against which a piece of the fresh cornea was pressed with proper precautions; the root bacillus is, therefore, not pathogenic for the tissue of the cornea.

The *hay bacillus* is also frequent on foreign bodies in the cornea; it is as long as the root bacillus, but finer, and forms long jointed fibres, growing in gray, round colonies, and rapidly liquefying the gelatine. In the large colonies, a gray plug lies in the centre, and the margin is indicated by a gray circular line; in the interspace, fine, gray, irregular fibres extend into a brighter, more liquefied mass. On using 120 diameters the contour of the bacilli, or their ligaments, resembles a forest of lances. It grows flask-shaped in the puncture canal, and liquefies the gelatine completely in eight days. On the potato a whitish-gray, thick clot grows along the incision, but does not opacify the cornea on grafting.

Two other corneal micrococci greatly resemble the hay bacillus; one, the diplococcus cinerareus corneæ (as I have named it), grows rapidly, and soon liquefies the gelatine. Its colonies are also like those of the hay bacillus, only the thicker margin has no lance-like appearance; it grows chiefly in the lower portion of the puncture canal, and is more often seen as a diplococcus, but also forms chains. On the potato it grows in small orange-colored points; when

grafted on gelatine it liquefies into a thick furrow, with a clay-colored mass in the centre. It is very variable, and not pathogenic to the cornea.

The second, coccus cinerareus corneæ, is single, with gray roundish colonies quickly liquefying, and only resembles the colonies of hay bacilli so long as the latter are small.

I also found numerous other yellowish and white cocci, which do not liquefy the gelatine so well as other kinds of bacilli. I have been accurately subdividing them for a long time, but will not describe them separately, as they are like other micro-organisms elsewhere.

In brief, a large number of micro-organisms, which occur in the soil and in the air and water, also flourish on foreign bodies in the cornea. Some of them I have classified; they are to be regarded here as saprophytes, and have either attained the cornea with the foreign body, or else in some manner reached the conjunctival secretion, and thence remained clinging to the foreign body. They live here upon and in the corneal epithelium, and their final action is to loosen the foreign body from its seat. These are not to be regarded as things of indifference; most of them are not pathogenic for the cornea, and even pathogenic micro-organisms can only develop their harmful action when the foreign body has passed through the corneal epithelium and Bowman's membrane; only then is suppuration possible. It is necessary to study these micro-organisms in order to select those that are pathogenic.

The micro-organisms do not show any particular regularity at any special season of the year, nor is there any one species that especially predominates over the other.

It is possible that some of the micro-organisms that I have described are the same that Fick has mentioned in his "Micro-organisms of the Conjunctiva," but unfortunately his descriptions are not sufficiently detailed for diagnostic purposes, and, as I believe, because he has resorted to the incubator, and has, for that reason, been entirely unable to observe the slow characteristic growth of the colonies.

PECULIAR COURSE OF A RETINAL GLIOMA.

By Dr. F. HOSCH, of Basel.

Translated by Dr. J. A. Spalding, Portland, Me.

Fritz B., æt. 3½ years was brought to me September 25, 1885, for "trouble with his right eye."

Patient healthy; pericorneal injection moderate; cornea stippled; pupil dilated ad maximum, and immovable; tension increased; small hyphæma.

Ophthalmoscope: nothing but a yellowish reflex from the fundus.

Although these symptoms suggested in so young a patient a glioma of the retina, the diagnosis was additionally confirmed by the ophthalmoscopic examination of the left eye, though made with great difficulty.

At the posterior pole of this eye were visible several large irregular white spots partially surrounded with pigment, which seemed at first to suggest an unusual form of degenerated choroiditis, but which on more careful examination were plainly nodulated elevations.

As both eyes were affected it was of course useless to enucleate the right eye, which had at first seemed necessary.

Six months later, in March, 1886, I was called to see the child whom I had never seen since the first visit. He was reduced to a skeleton. The right eye was greatly bulged forward, conjunctiva very red and swollen, cornea opaque.

The sight of the left eye seemed to be fairly good, and strange to say the curious and almost impossible ophthalmoscopic condition remained about as before, and the eye was not at all protruded.

The patient died on the night of April 9th, and on the next day the eyes were enucleated.

The front of the right eye was altered into an ulcerated malacious mass; in the rear hung a large tough reddish mass, with an irregular nodulated surface, which with the eye was easily shelled out; no trace of the optic nerve, which had apparently been totally absorbed in the tumor.

In regard to this eye there is not much to say; the glioma offered the stereotyped traits; in the rear it had penetrated the sclera, and given rise to the epibulbar tumor before mentioned.

There are no distinct traces of the retina, although the epithelial pigment is everywhere preserved, though puffed up at a few localities. Inside of this we find the tumor completely filling the interior of the eyeball and composed of closely compressed round cells and a few spindle-shaped cells. It has pushed forward toward the lens in roundish masses with numerous cavities, frequent hemorrhages, and whatever remains of the vitreous; contains giant pus cells, hemorrhagic extravasations, neoplastic vessels, pigment, and a few sharply defined round glioma foci.

Between the epithelium and sclera, the latter of which contains numerous nests of glioma cells, and is traversed by rows of the same along the vessels, we find the choroid enormously thickened in the rear by a deluge of gliomatous particles, and its structure totally destroyed. It really forms a single glioma plate, thickest behind and thinnest in front, where traces of the original choroid can be seen.

The ciliary body and iris are also thickened and filled with the neoplasm. The anterior chamber is nothing but a slit, with reticulated tissue and numerous round cells.

Cornea irregular on the surface, with plenty of glioma cells from the intraocular growth, which at one spot penetrates the otherwise normal Descemet's membrane, and fills the entire cornea.

The lens lies like a cast in the tumor; capsule and epithelium are well preserved.

The optic nerve, which was attained by the merest chance, has almost entirely disappeared in the tumor, and is only recognizable by the intact sheath, and in a few sections by the gaping central vessels.

In the *left* eye, the gliomatous degeneration is almost exclusively confined to the papilla, which is deeply excavated, and the cavity filled with a fibrous mass containing glioma cells, a few vessels, and round glioma foci. Directly in the rear this mass passes gradually into the optic nerve, which especially in its central portions contains an abundance of glioma cells.

The well marked pigmentation alongside the excavated papilla is worthy of observation; it extends in irregular roundish and elongated figures on the one side to the scleral foramen, where it gives way to the atrophic optic fibres, thickly interspersed with blue (tinted) granules, and on the other it passes directly forward into the normal pigment epithelium.

A small round mushroom-shaped tumor, starting from the external retinal layers, lies at the edge of the excavation, with scattered pigment epithelium and minute cavities (cross-sections of vessels), surrounded by glioma cells. That portion of the tumor directed inward consists of a fibrous substance interspersed with a few glioma cells, whilst that portion directed toward the choroid is composed of a fan-like arrangement of coarse beams, with large glioma cells, and the same sort of cavities varying in size and surrounded by blue nuclei and pigment.

Just inside of the little growth we find the only trace of the retina in the enormously thickened fibrous layer, interspersed with large blue-tinted nuclei. The latter, which are more abundant in that portion of the fibrous layer directed toward the choroid, resemble the elements of the granular layer. All of the divided vessels are surrounded by an abundance of glioma cells, and also contain blue nuclei.

The hitherto normal external granular layer ceases suddenly at the anterior edge of the small tumor, and passes over into the before-mentioned fibrous mass interspersed with massive nuclei. The inner granular layer can, however, be followed in a very flabby condition to the top of the tumor, and also at this spot is lost in the fibrous mass which must be regarded as made up of the original fibre

layer, *plus* the rest of the retinal layers in an extremely altered condition.

The same mass contains a few round, sharply defined clumps, which have been tinted violet by hæmatoxylin.

The same condition of things is found on the opposite margin of the excavation, only the tumor is less developed and the pigment epithelium highly proliferated. At one small spot the pigment is pressed apart by a fibrous tissue abundantly interspersed with blue nuclei. Further development would undoubtedly have led to a tumor similar to that on the other side. All of these alterations are confined closely to the neighborhood of the optic papilla; a little way off the retinal layers are normal.

The retina directly adjoining the papilla is loosened into a few small folds, and the choroid, otherwise normal, somewhat thickened by an abundance of glioma cells.

The anterior portion of the eyeball is normal.

The relatively slight extension of the glioma in the left eye explains the prolonged preservation of sight, to such an amount, at least, that the very frail child was able to find his way about up to a few days before his death. The neoplasm extending from the retina into the papilla, and excavating it deeply, had evidently pushed the nerve-fibres to one side, without destroying them, so that the peripheral portions of the retina still preserved some perception of objects.

It is interesting to observe the tumor encroaching upon the optic nerve, yet simultaneously sparing the retina and vitreous, and, further still, the extensive proliferation of pigment sharply defining the limits of the neoplasm, and extending far behind the excavation into the papilla. I have not been able to discover a similar case in all the reported literature of the subject.

The course of the disease in the left eye varies also a good deal from the common run of cases; whilst in the right eye all went as usual, in the left, with about the same anatomical condition of the parts, as ascertained by the ophthalmoscope nine months before, the pathological process clung to the neighborhood of the posterior hole without

early affecting the entire retina and detaching it from its resting-place, as so invariably happens.

It is scarcely possible that the tumor can have crossed over from the right eye through the chiasma, for then the gliomatous elements would have *increased as we went toward the brain*, which was not at all the case.

We must therefore conclude that the disease affected both eyes, running the usual course in the right eye, whilst in the left it localized itself around the papilla, and then very slowly extended into the optic nerve.

ON UNEQUAL ACCOMMODATION IN HEALTHY EYES AND IN ANISOMETROPIA.

By Dr. A. FICK, of Zuerich.

(*With one wood-cut in the text.*)

Translated by Dr. J. A. Spalding, Portland, Maine.

I.—Introduction.

The eyes can accommodate in the following ways:

1. The impulse is *equally* strong for both eyes, and results in:

a. An *equal accommodative effect* in both eyes.

b. An *unequal effect* in both eyes.

2. The impulse is unequal, and results in:

a. An *unequal effect* in both eyes.

b. An *equal effect* in both eyes.

Of course 1 *a* is the rule, and the other conditions (if they ever occur at all) are the exceptions. Indeed, it is the prevailing opinion that 2 *a* and 2 *b* are impossible, and this is based on experiments by Hering,[1] Donders,[2] Schweigger,[3] and Rumpff.[4]

In order to prove whether the two eyes could accommodate alike at the same moment, Hering held a needle as far as possible to the side of the median plane, so that it was at different distances from his eyes, and of course unequal accommodation was needed to see the object clearly at the same time with both eyes. On voluntary squinting and

[1] Die Lehre vom binoculaeren Sehen., 1868, 132.
[2] Die Anom. d. Refract. u. Accom., 1888, p. 471.
[3] Handbuch. d. Augenheilk., 1873, p. 70.
[4] K. M. f. A., 1877, Beilageheft.

producing double images, only one of the needle points appeared distinct, and he failed at every attempt to see both points simultaneously with the same distinctness. He therefore concluded that an unequal impulse of accommotion is impossible for the two eyes.

Donders set out with the idea that a pair of emmetropic eyes, one of which is armed with + 1.25D can only read fine type binocularly, with the aid of unequal accommodation. But as he could not do this despite every sort of exertion, he asserted that with equal breadth of accommodation in both eyes, we are unable to compensate for the slightest difference of refraction by unequal accommodation.

Schweigger experimented with anisometropes, causing fine type to appear double with help of prisms, and proved to his satisfaction that the difference in refraction is not equalized, because only one of the images was well defined, the other indistinct.

Rumpff selected as test a row of parallel wires or their interspaces. On holding this optometer so that it was 30 *cm* from one eye, and 34 from the other, only one eye was correctly adjusted, no matter whether the accommodation was judged by alternately covering the eyes, or by comparing the double images produced by prisms. The result was somewhat different when the optometer was held at an equal distance from both eyes, and artificial anisometropia produced by lenses. In such a case binocular vision was good, despite a slight anisometropia, but when double images were produced one was clear and the other ill-defined. When the anisometropia was increased, acute binocular vision also ceased. Finally he experimented with stereoscopic images; plates with very fine and even perforations were placed in the stereoscope opposite each eye; with isometropia the illuminated dots to the right and left appeared equally large, and acute, so long as the plates were kept at an equal distance from the eyes, but unequally distinct and large as soon as the one plate approached or was removed from the eye concerned. Inversely if the observer were naturally or artificially anisometropic the plates had to be arranged at different distances, in order to make the

points equally large and equally well defined. Rumpff therefore concludes that unequal accommodation is as impossible in isometropia as in anisometropia, so long as binocular vision is maintained.

I think that all these experiments simply prove no compensation was made for the natural or artificial difference of refraction. At all events they do not prove that some sort of compensation is *impossible* in case it is needed to produce a perfect act of vision. For in Hering's, Schweigger's, and most of Rumpff's experiments, the visual act has taken no interest in the unequal accommodation, and in Donders' experiment, although a certain interest in the compensation of the unequal adjustment has been present, yet there is no proof that it has been even *partially* satisfied. For Donders expressly states that on opening the eye correctly adjusted, the dispersion images of the other, falsely adjusted eye have become distinctly smaller.

II.—Stereoscopic Reading Experiments.

It will now be granted that an experiment to show the possibility or impossibility of unequal accommodation must be so arranged that, on the one hand, the retinal images of the two eyes can be observed separately, and, on the other, that the greatest possible interest in binocular combined vision must be present.

Such an experiment can be made with the prism-stereoscope, when we place therein a reading test like that on the following page, and as subsequently described.

Identical cuttings from two copies of the same newspaper are glued together at a short distance from one another and at the same height on pasteboard; a part of the words or parts of words on the two sides are covered over alternately with white paper, whilst on the left-hand piece a horizontal stripe is painted, and on the right a vertical. A person with normal eyes with correctly chosen prisms, will blend the two pieces with gaps, into a sheet entirely covered with reading matter, and the two stripes into a cross.[1] In the sixth line, *e. g.*, the word "wuerden" be-

[1] The stripes serve to locate words, and aid in the blending of portions of words.

Die Fehler, die das Referendum seit seiner allgemeinen Ein in der Schweiz machte, bor Aller Angen und sind leicht zählen, diejenigen aber, welche die Räthe und Tag seit dem Jahre 1815 haben, nimmt sich Nie die Mühe nachzu Sie würden biell auch zu zahlreiche füllen. Man musz eben Sache auch nicht so bor wie man es nament in den gegnerischen Reden während der periode öfter lesen als ob in den Repräsentanten nothwendig oder wenig wahrscheinlich alle Intelli eines Landes ber sei und dagegen bei der Volks die bon derselben entblöszte Masse allein für sich handle. Weder das Erstere, noch das tritt thatsächlich ein. Die Grossen Räthe sind nicht die Elite des Volks, sondern enthalten ebenso biele zu wenig berst bon Andern abhän oder charakterschwache glieder nach Prozentzahl essen, wie das im Ganzen.

4) Endlich hat das Referendum den Vortheil, dass es die annten „gebildeten" nothißt, in beständigem tackt mit den untersten klassen zu bleiben für deren fortdauernde hung und Belehrung zu Es ist also der allerwir Hebel der Volkser auch in diesem prophyl Sinne. Es ist dabei nicht Meinung, dasz der Vor des näheren Am zwischen den beiden natür Klassen, die auch in der Demo immer borhanden sein werden

Die Fehler, die das Referendum seit seiner allgemeinen Einführung in der machte, liegen bor Aller und sind leicht aufzu diejenigen Sünden welche die Groszen Räthe und satzungen seit dem Jahre begangen haben, nimmt sich mand die Mühe rechnen. Sie wurden eicht auch zu reiche Bände füllen. Man musz sich die Sache auch nicht so stellen, wie man es lich in den gegnerischen während der Revisions öfter lesen kann, als ob in den bersammlungen nothwendig oder stens wahrscheinlich alle genz eines Landes einigt sei und dagegen bei der abstimmung die bon gänzlich entblöszte allein für sich handle. Weder das Erstere, noch das Letztere tritt thatsächlich ein. Die Räthe sind nicht eo ipso die Elite des sondern enthalten bielleicht ebenso biele zu wenig ündige, bon Andern gige, oder charakterschwache Mit nach Prozentzahl bem wie das Volk im Ganzen.

4) hat das Referendum den groszen dass es die sogen „gebildeten" Stände in bestandigem Kon mit den untersten Volks zu bleiben und deren fortdauernde Erzie und Belehrung zu sorgen. Es ist also der ksamste Hebel der ziehung auch in diesem aktischen Sinne. Es ist dabei unsere Meinung, dasz der theil des näheren gangs zwischen den beiden lichen Klassen, die auch in der kratie immer borhanden sein

longs to both eyes, whilst of the next word "vielleicht," the last half, "eicht," belongs to the right eye alone, and the "viell" to the left alone. If, therefore, we ask whether the half, "eicht," appears clearly or ill-defined, the patient gives us by his answers a key to the correct or false adjustment of his right eye, whilst if he tells us how the other half looks we learn whether the adjustment of the left eye is correct or not. Of course a person with normal eyes will see the portions "viell," and "eicht" equally clear, but if we cover one of his eyes with a convex or concave lens, the words and parts of words will only be seen accurately with one eye, and indeed with minute type and a great distance from the plate he will only be able to read with one eye. Numerous gaps will therefore be seen unless by an unequal effort of accommodation the difference of refraction due to the lens is partially or entirely equalized. And in this compensation the reader has a greater interest than in the experiments previously mentioned.

I have experimented largely after this plan, the persons having normal sight, emmetropia or slight hypermetropia and proper muscular equilibrium. I will here describe one experiment in detail.

Stereoscopic experiment with L. F., æt. sixteen, student. Refraction Em; S. both eyes $\frac{5}{5}$; muscular equilibrium. Letters 50 *cm* distant; type about the size as Sn 1. The prisms that fuse identical words of the two leaves measure 18° combined.

The right eye is now covered successively with + 0.25, and 0.75 and 1D, without interfering with binocular vision, but when + 1.5D is used (the left eye still unarmed) difficulties arise which disappear on reducing the prism to 16°. The half words visible only to the right eye (for the rest of this paper called Right half words as the others are called Left half words) now appear hazy, though still legible; *e. g.*, of "auf zuzaehlen" the "zaehlen" with the left eye is well defined, whilst the "auf zu" with the armed right eye is hazy. The patient volunteers the remark that the "auf zu" appears at one moment clear and again indistinct, while the "zaehlen" is clear all the time.

Weak concave lenses are next added to the left eye, convex 1.50D still covering the right. The glued over-patches first appear as openings; then after waiting and after some exertion by the experimenter, the missing words jump up into the blank spaces, at first quite hazy, then gradually more and more distinct.

1. With — 0.75D left and + 1.50D right prisms of 16° are too weak.

2. With — 1D left and right as before, with prisms of 18°, binocular vision is possible, but requires great exertion.

3. With — 1.5D left and + 1.5D right, and prisms of 18°, the missing words, or half words, rise up into the sight for a short time.

Before explaining the experiment I will insert a few remarks volunteered by the observers themselves.

Almost all of them complained of a feeling of exertion and rapid weariness the moment that great differences of refraction (1.5D and over) had to be overcome. But with such a state of affairs binocular reading was not only more difficult, but it took a longer time, and for two reasons: In the first place the experiment ought not to be begun with great variations in refraction (the higher differences should only be reached very gradually), and, secondly, in each step of the experiment the time till the missing words became legible grew longer and longer the greater the difference in refraction already attained.

Further, the eye with the convex lens was always the one to see the letters blurred. It was only when the limits of the attainable were approached, *e. g.*, when a difference in refraction of + 1.25D left and — 1.25D right, *i. e.*, 2.75 dioptries had to be overcome, that now the left, and anon the right half-words, appeared most indistinct. In every case the experiment terminated with *both eyes* seeing the print hazy and illegible, except for an instant, and then with the greatest exertion.

Thirdly, we discovered that practice enables a certain amount of refractive difference to be overcome; thus one person by practice overcame in three weeks a difference of 3.25D.

I have examined too few people to know whether the age exerts any influence upon the greater or less capacity for conquering this difference of refraction. A greater number would enlighten us in regard to the maximum possibly overcome by practice. Further perusal will, however, show that, other things being equal, age diminishes the capacity for overcoming the difference in refraction of the two eyes.

III. Explanation of the stereoscopic experiment:

The first question to be asked is whether the artificial difference of refraction in our reading experiment is conquered by different accommodation of the two eyes or simply by increased attention and the deciphering of hazy retinal images. To answer this precisely we must know with what optical defect a normal eye can still decipher the type at the chosen distance with the greatest possible exertion. This can be easily discovered when we bring the test into the far point of the dioptric system of the eye plus lens convex, and then strengthen the lens with + 0.25, + 0.50, and +0.75 D. We proved that an average dioptric defect of 0.25 D would be tolerated, and that reading became more guesswork when the defect amounted to only 0.5D. Thus in the above detailed experiment the same type used at 50 *cm* with both eyes was read with one eye easily with + 2.25, with some difficulty when + 2.50 was substituted, whilst with + 2.75 nothing could be deciphered. We are therefore justified in concluding that in experiment (2) the right eye was accommodated at least 0.50D too much, and the left eye 0.50D too little, provided we take it for granted that a refractive defect of the system eye, plus lens, about — 0.50 D, produces the same disturbance as a defect of + 0.50D. This supposition, once granted, we are compelled to assume that in experiment (2) the right eye was accommodated *at least* 1.50D less than the left, and that consequently unequal accommodation to the amount of at least 1.50D is a possible thing, despite all prevailing views and opinions. For the right eye could accommodate at the utmost 1D, and the left would have to accommodate at least 2.5D.

It is easy to understand that experiments with other persons gave qualitatively the same results, but in order to

compare the *quantitative* results a portion of those obtained are contained in the following table:

Date.	Name.	Age.	STEREOSCOPIC READING EXPERIMENT.				
			With binocular combined reading, the maximum difference of refraction tolerated.	Distance of reading test from the eyes.	Prism used.	With monocular reading at the same distance, the maximum defect of refraction tolerated.	Calculated *minimum* in the difference of accommodation.
September 23, 1887...	H. H.	9	1.5 D	50 *cm.*	16 °		
" 29, " ..	L. F.	16	2.5 "	5.0 "	18 °	0.5 D	1.5 D
" 26, " ..	R.	22	2.0 "	50 "	10 °	0.25 "	1.5 "
" 24, " ..	M. F.	24	3.25 "	46 "	22 °	0.826 "	1.6 "
" 29, " ..	"	24	2.75 "	50 "	20 °	0.75 "	1.25 "
" 22, " ..	"	24	3.00 "	55 "	16 °	0.68 "	1.64 "
October 3, 1887... ..	N. F.	33	2.25 "	50 "	16 °		
" 6, "	"	33	2.50 "	50 "	20 °	0.25 "	2.00 "
January 19, 1888.....	Dr. G.	24	2.25 "	52 "	18 °		

This table needs no explanation, except about the last two columns, the last but one of which shows the maximum dioptric defect tolerated. The variations in the latter are due to the following causes: First, the defect depends on the size and distance of the type, for with so much the larger circles of dispersion the reading can be accomplished, the nearer the test to the eye, the greater the visual angle. Secondly, the minimal interval in the trial lenses is 0. 25D. Finally a lens was said to be tolerated, when with it even a single word was (we will not say correctly) read, but correctly named. Still it is clear, that in this point of view, accidents, such as the length of the word, or the patient's familiarity with the same, or its happening to begin with a capital, etc., must play an important rôle. If we now consider that the inexactitude of the maximum of refractive defect with which reading can still be accomplished weighs heavily against the last column in the table, it follows that the figures in it do not represent the precise difference of accommodation present, but the minimum that must at least have been present (which does not, however, exclude a greater difference still).

I will here remark, and it is of interest and very comprehensible with the connection between accommodation and

convergence, that in this experiment weaker prisms go with the use of stronger convex lenses in reading, and inversely, the stronger prisms had to be returned to when the second eye began to read through concave lenses.

So far as I can see, only four authors, Schneller [1] and Woinow [2] in healthy eyes, and Werth [3] and Fuchs [4] in anisometropia, have made observations on the presence of unsymmetrical accommodation.[5] The first two attempted to prove experimentally, that under physiological conditions unsymmetrical impulses might result in unequal alteration of refraction (Case 2*a*). If their attempts have not met with the consideration that they deserved, it has been simply owing to the subjective nature of the experiments.

Both authors experimented on themselves; Schneller looked at points or lines in the stereoscope, whilst convex or concave lenses were held before one or the other of his eyes. And as he was able to see "just alike" with each eye, despite the artificial anisometropia, he thought that he had proved the existence of unequal accommodation.

He also experimented with a reading test; he placed Jaeger 1 at 25 *cm* before his eyes, hid half of the test from one eye, and held before the other eye glasses gradually increasing in strength. The armed eye saw the entire row of type, the other eye only one half of the test in common with the first eye. Nevertheless, the *entire* test appeared distinct. And on covering the one eye, the other was correctly adjusted. As Schneller says: "The experiment is not free from subjective impressions, and for that reason is not fitted to answer the question."

Woinow's test was also subjective; he gazed with both eyes at a strip of cobalt-blue glass, illuminated from behind and held at a different distance from the two eyes. But as he saw the strip clearly and without a tinted border,

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[1] *v. Graefe's Archiv*, Bd. xix., 1.
[2] *Ibid.*
[3] Inaug. Dissert. Kiel, 1874.
[4] *Archiv f. Augenheilkde.*, Bd. xv., 1.
[5] Buffon observed anisometropia in the last century, but I have not been able to discover his paper on the subject.

he concluded that his eyes had accommodated differently, and each correctly for the glass.

Werth was the first who sought by experiments on persons, to prove that unequal accommodation exists. One patient had: right eye, Em, S $\frac{2}{3}$; left eye, M $\frac{1}{30}$; S 2!!

The visual lines were correctly arranged for all distances. Knapp's optometer and the stereoscope showed that with binocular fixation at short distances the accommodation of the right eye was almost lost, but that the left accommodated concomitantly when the experiment compelled the right eye (the one usually neglected) to accommodate.

The second person had R. E., M $\frac{1}{11}$, S 1; L. E., Hm $\frac{1}{30}$, As $\frac{1}{48}$, axis 180′, S. $\frac{1}{2}$; insufficiency of the interni. As the stereoscope test failed, the patient was asked to look to a distance whilst Werth observed the retinal vessels of the left eye in the inverted image. If the right eye was then adjusted for a near point, the inverted image of the left retinal vessels did not alter its situation; inversely, when the left eye accommodated, the theoretical motion to be looked for in the retinal image of the right eye was easily observed. Werth concludes, that with different sight in the two eyes, the better eye often accommodates alone, even if, as was the case in the first patient, the weaker eye shows neither latent nor manifest strabismus.

Fuchs describes two cases of anisometropia; both had an emmetropic and a myopic eye, and binocular vision, or at least a correct adjustment so far as concerns the direction of the visual axes. In both the accommodative impulse usually attained the myopic eye alone, so that objects beyond the far point of this eye could not, on the whole, be seen distinctly so long as both eyes were open, but if the myopic eye were then closed the other eye accommodated and the object appeared distinct. Hence the accommodation was independent in the eyes of both patients, although both eyes were normally directed upon one object. Therefore, the two cases might more properly be described as "disturbance of vision by unsymmetrical accommodation.

Michel[1] says on this subject: "It is not at all improb-

[1] Lehrbuch, 1884, 44.

able that the accommodation of the eyes may be different if the refraction is different."

Nagel,[1] also, in referring to Rumpff's paper, says: "No decisive weight can be allowed to these negative results, since many pathological experiences hint at the possibility of unequal accommodation in the two eyes."—"Still further experience will be needed to decide the question."

Even if I am willing to grant that Schneller's and Woinow's observations are correct, yet I think that a logical and *objective* proof of the possibility of unequal accommodation under physiological conditions will be for the first time offered by my experiment, when:

(1) carried out by unprejudiced persons, and when we,

(2) employ as a test, *not the clearness or indistinctness of any given object, but the recognition and the reading of type*, as a reagent for unequal accommodation in the two eyes.

IV. **Criticism of the stereoscopic reading experiment.**

I have so far taken it as proved, that reading, too, could not be accomplished with an accommodation too small by 0.5D, if under the chosen circumstances it had become impossible on account of an accommodation of 0.5D *too much*. It is now for us to prove that this is correct. I deprived a normal eye of all its accommodation by help of atropine; at least the pupil was dilated *ad maximum*. Vision was slightly affected by the enlargement of the pupil. Sn 10 at 5.7 *m*, without a lens. The effect of concave and convex lenses on the vision is as follows:

At 5.7 metre No. 10 without a lens, No. 15 with + 1D, No. 36 with + 1.5D, No. 60 with + 2D, No. 60 with + 2.25, and No. 60 with + 2.5D, but no longer.

On the contrary, with concave lenses: No. 6 with − 0.50D, No. 10 with − 0.75D, − 1D, − 1.5D and − 2D; No. 15 with − 2.5D, No. 20 with − 3D, and No. 60 with − 3.5D.

Finally, small newspaper type was read without a lens at 35 *cm*, though with great difficulty. Can we conclude from this that too little refraction is a less hindrance to reading than an equal overplus? I think not; for it seems as if

[1] Die Anom. d. Ref. u. Acc. d. mensch. Aug., 1880, p. 477.

despite the atropine some accommodation remained. I then tried homatropine on myself, and to be sure of obtaining the maximum effect, I applied several drops after the pupil had long been dilated. Nevertheless, I perceived objectively and subjectively that some accommodation still remained.

The same question was then tested in another way; by calculating the size of the circles of dispersion that must originate in a normal eye, without accommodation, when it looks at an object point through lenses of + 0.25, + 0.50, + 0.75, or + 1D, or again through the same numbers of concave lenses. This dimension we easily find if we have previously calculated how far the image point lies *in front of* the retina, when the defective adjustment is produced by concave lenses, and how far *behind the retina*, when concave lenses of equal refraction are employed. In order to cast aside the displacement of the nodal points, I employed the formula:

$$(1)\quad \frac{f}{p} + \frac{f'}{p'} = 1,$$

by which we can find the position of the image point in front of or behind the retina, when the distance of the object point p from the anterior principal plane is given; for f and f' the anterior and posterior focal distances of the normal eye are 14.86 *mm* and 19.87 *mm*. But we may now regard the virtual image point produced by a lens in front of the eye as the object point, and reckon its distance from the anterior principal plane. We then find the situation in the eye of that focal image of the original object point which is produced by the dioptric system, plus a lens. To simplify the calculation, we imagine the object point in infinity; further, we take the distance of the lens from the anterior principal plane as 10 *mm*; then the distance of the (virtual) object point from the anterior plane is:

(− 4000	+ 10)	*mm*,	with	a	lens	of	+ 0.25	D.
(− 2000	+ 10)	"	"	"	"		+ 0.5	"
(− 1333.3	+ 10)	"	"	"	"		+ 0.75	"
(− 1000	+ 10)	"	"	"	"		+ 1.	"

Further:

(+ 4000 + 10) *mm*, with a lens of − 0.25 D.
(+ 2000 + 10) " " " " − 0.50 "
(+ 1333.3 + 10) " " " " − 0.75 "
(+ 1000 + 10) " " " " − 1. "

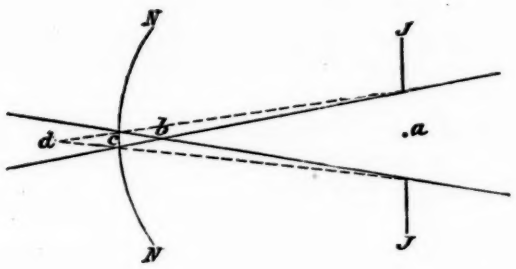
If we carry out the calculations we find for the various p', which for easier review we will furnish with an index of + 0.25. + 0.50, etc., the following values:

p' + 0.25 = 19.95, when the picture will be *in front of* the retina, 0.07 *mm*.
p' + 0.50 = 20.02 " " " " " " 0.15 "
p' + 0.75 = 20.09 " " " " " " 0.22 "
p' + 1. = 19.58 " " " " " " 0.29 "
p' + 1.25 = 19.51 " " " " " " 0.36 "
p' + 1.50 = 19.43 " " " " " " 0.44 "
p' + 1 75 = 19.36 " " " " " " 0.51 "
p' + 2. = 19.25 " " " " " " 0.58 "

But if concave lenses are held before the emmetropic eye without accommodation, we have the following calculations:

p' − 0.25 = 19.95 when the image will be *behind* the retina, 0.07 *mm*.
p' − 0.50 = 20 02 " " " " " " 0.15 "
p' − 0.75 = 20.09 " " " " " " 0.22 "
p' − 1. = 20.16 " " " " " " 0.29 "
p' − 1.25 = 20.24 " " " " " " 0.37 "
p' − 1.50 = 20.32 " " " " " " 0.45 "
p' − 1.75 = 20.39 " " " " " " 0.52 "
p' − 2. = 20.47 " " " " " " 0.60 "

A comparison of these tables shows that the image point lies precisely as far *behind* the retina, when the refraction of the eye is too little by 1.25D (or less), as *in front of* the retina when the refraction is too great by 1.25D. When the minus of refraction is greater than 1.25D, the image point moves more rapidly behind the retina than before in front of it, with an equal overplus of refraction. We may, however, leave the latter entirely out of consideration, since we are only engaged in comparing the size of the circles of dispersion which originate from optical defects of from + 1D to − 1D, at the most.



Let us now examine this diagram: *NN* denotes the retina; *JJ* the iris, with a pupillary diameter of *p mm*; the point *b* lies as far in front of the retina as the point *d* behind it. Then

$$(2)\quad \frac{ab}{p} = \frac{cb}{n}$$

in which *n* denotes the diameter of the circle of dispersion produced by the bundle of beams diverging from *b* upon the retina. Further,

$$(3)\quad \frac{ad}{p} = \frac{dc}{n'},$$

in which *n'* denotes the diameter of the circle of dispersion produced by the beams converging on *d*. Now $ad = ab + 2.cb.$, so that we can write

$$(4)\quad \frac{ab \times 2cb}{p} = \frac{cb}{n'},$$

whence by the subtraction of equation (2) from (3), and by simple transposition, we have

$$(5)\quad \frac{n - n'}{n\,n'} = \frac{2}{p},$$

which signifies that the diameter of the dispersion circle of an image point in front of the retina, and of another equally distant behind, are not of the same size, and that owing to the positive nature of $\frac{2}{p}$, the diameter *n* of the bundle of rays diverging from *b* is always the greater. In order to make this plain, we must calculate precisely the values of *n* and *n'* for all the cases in which we are interested. If we take *p* the diameter of the pupil as 4 *mm*, and *c* the distance of the pupillary plane from the retina as 19 *mm*, equation (2) (by inserting the values which correspond to the dioptric defect of + 0.25) is transformed into

$$(6)\quad \frac{19 - 0.07}{4} = \frac{0.07}{n \times 0.25};$$

in other words, $n + 0.25$, *i. e.*, the diameter of the dispersion circle in case of a dioptric defect of + 0.25D, is 0.014 *mm*.

I have calculated in the same way the diameter and radius of the corresponding circles of dispersion for the fifteen other situations of the image point.

Defect of the adjustment in dioptries.	Radius of the corresponding circle of dispersion.	Defect of the adjustment in dioptries.	Radius of the corresponding circle of dispersion.
+ 0.25	0.007 *mm*	− 0.25	0.007 *mm*
+ 0.50	0.016 "	− 0.50	0.016 "
+ 0.75	0.023 "	− 0.75	0.023 "
+ 1.	0.031 "	− 1.	0.030 "
+ 1.25	0.039 "	− 1.25	0.038 "
+ 1.50	0.047 "	− 1.50	0.046 "
+ 1.75	0.055 "	− 1.75	0.053 "
+ 2.	0.063 "	− 2.	0.061 "

This table shows that the clearness of sight is equally interfered with, whether the refraction of the eye is 1D too much or too little, and that we were fully justified in concluding that a minus or plus of accommodation could not exceed an average of 0.5D, so long as newspaper type was readable at a certain chosen distance.

So far as I can see, two objections can be raised against these propositions: first, that a dioptric defect produced by a lens interferes more noticeably with the sight than an equal defect produced by false accommodation. Such an objection can be calmly granted on principle without in the least doubting the possibility of unsymmetrical accommodation, for that circumstance might suffice to explain the most trifling variations in the acuteness of vision, but it could never make anybody comprehend how a certain type at a certain distance can no longer be deciphered with a defect of 0.5D produced by a lens, whilst the same type can still be deciphered at the same distance with a defect from 1.D to 1.5D greater when it depends on accommodation.

In the second place it may be objected, that in calculating the circle of dispersion I have erroneously accepted the

pupillary orifice as the base of the cone of light, the summit of which is formed by the image point (*b* and *n* in the wood-cut). But simple reflection shows that the absolute size of the base of that cone has no influence upon the proportional measurement of *n* and *n'*. This will be seen if we write equations (2) and (3) in this way :

$$(2)\ n = \frac{cb}{ab} \cdot p$$

$$(3)\ n' = \frac{dc}{da} \cdot p.$$

Any one can see at a glance that the eventual equality of *n* and *n'* is not at all influenced by bringing into the calculation the pupilary diameter *p* itself, or a measurement proportional to the same.

V. Cases 1b and 2a.

Every ophthalmic surgeon has seen hundreds of cases of 1*b*: equal impulse in both eyes, but unequal accommodative effect. A patient who has been atropinized in one eye shows this condition for a week. Whilst the action of the atropine fades away, the impulse habitually sent to each eye acts normally on the normal eye, but with less power on the other. In other words, a symmetrical impulse produces refractive alteration of varying strength. The conditions must be the same when presbyopia of varying degrees is present, when both ciliary muscles, but not both lenses, react alike to an equally powerful impulse. Kaiser has described[1] his own case with a difference of $\frac{1}{60}$ between the eyes, and others of a similar nature must be known.

Such a presbyope will either read and write with equal impulse but unequal dioptric adjustment of his eyes (Case 1.*b*), or, in the interest of perfect and binocular vision, he will send unequal impulses to the lenses that are reacting differently, and thus forcibly produce an equal, or nearly equal dioptric arrangement (Case 2*b*). The stereoscope will tell us which of the two. I append some recent notes on cases of anisometropia.

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[1] *v. Graefe's Archiv.*, Bd. xiii., 3.

Case 1.—Mrs. M., æt. forty-seven, can no longer thread her needle. Left eye M 1 D, S = 1 ; near point, 24 *cm ;* accommodation 3.1 D. Right eye M 1 D, S = $\frac{1}{2}$; near point, 30 *cm ;* accommodation, 2.3 D.

Insufficiency of interni ; visible squint when weary ; cannot read in the stereoscope with both eyes, but the right half words seem more indistinct than the left.

With right eye + 0.75 D, and plain glass left eye, all the half words are equally clear. She sees them at the same time in each eye, but cannot fit them into one another, or tell whether the left words, *e.g.*, are pushed too far or not far enough to the right. It would seem as if equal impulses were transmitted to each eye, and that these equal impulses of an unequal accommodation set free unequal quotas of accommodation.

Glasses ordered : + 1.5D left, + 2D right.

A few weeks later the patient reported herself much pleased with the combination.

Case 2.—A student, æt. twenty ; left eye aches when reading ; right eye not so much ; constant asthenopia.

Both eyes Hm = 1D, S = 1.

Left eye, near point, 13 *cm*, and accommodation 8.7D.

Right eye, near point, 10 *cm*, and accommodation 11D.

A fews days later, near point, 14 *cm*, accommodation 8.1D ; right eye, near point, 12 *cm ;* accommodation 9.3D ; in other words, a difference of accommodation at each examination and against the left eye each time.

Stereoscope Examination.

1. Without lenses ; right half words clearer than the left.

2. With + 1D left and plain glass right, the right half words are more hazy than the left.

3. With + 0.75 left and plain glass right, the right half words are more indistinct than the left.

4. With + 0.50D left and no lens right, the right half words are much plainer than the left.

The limit lies between 0.50 and 0.75D. In other words, on adjusting the eyes for 35 *cm*, the accommodative *effort* of the left eye is between 0.5D and 0.75D smaller than that of the right. Since the *breadth* of accommodation in the left eye is 1.2D less than that of the right (almost double), and since in reading at 35 *cm* about one half of the breadth of accommodation that can be

relied upon is actually used, we ought to assume that here also an equally strong accommodative *impulse* had produced unequal effect of accommodation (Case 1*b*). The patient even volunteers the remark that the left eye is the one that particularly aches and smarts on reading and writing. It would therefore seem as if we had the right to think that on reading without lenses more powerful impulses are sent to the left eye than to the right. And, indeed, this supposition was confirmed, for after using atropine the left eye showed Hm = 2.25D, and right Hm 1.50D.

The accommodative asthenopia is partially apparent, and is to be compensated for, or, at least, diminished by, equalizing the anisometropia. Glasses of + 2.25D were ordered for the left eye, and + 1.50D for the right.

VI. Theoretical Reflections on the Accommodation of Anisometropes.

Even the latest text-books on ophthalmology begin the chapter on anisomtropia by stating that the apparatus of accommodation in both eyes is simultaneously and equally innervated; in other words, that the accommodative impulse and its result are equal for both eyes. The various authors then endeavor to harmonize with this assertion the facts observed in the examination and treatment of anisometropes. The first fact is this:

(1) That, despite extensive anisometropia, normal binocular vision may be so perfect as to satisfy Hering's drop experiment.

(2) That complete correction of the anisometropia by lenses of different foci is not well tolerated in a majority of cases, and that the patient feels more comfortable with lenses of nearly the same strength before each eye.

Since my stereoscope experiment has proved that even physiologically the accommodation of one eye can within certain limits act independently of that of its partner, no one can deny that the corner-stone of the anisometropic theory, the axiom of symmetrical accommodation in an anisometropic pair of eyes, possibly rests upon an erroneous basis. We will, however, for the present let the axiom stand, and inquire if the facts so far observed coincide with this axiom. Let us take the first fact, that normal binocular

vision can exist despite an anisometropia of several dioptries. Suppose that the difference of refraction is two dioptries, and that the patient endeavors to read at 30 *cm*, newspaper type the size of No. 2 Sn. In doing this, the one eye (and according to prevalent theories the one with the greater refraction) would be correctly accommodated, and the other eye accommodated 2D too little. But my stereoscopic test has shown that even with a refractive defect of only 1D, the circles of dispersion become so large that even larger type than Sn No. 1 can no longer be read at 30 *cm*. If now the dioptric defect amounts to 2D, it would be idle to talk of fusing the two retinal images, for the image of the falsely adjusted eye will be suppressed, or it will interfere with the vision of the correctly adjusted eye, either of which occurrences are logically irreconcilable with the fact of perfect binocular vision. But since the fact attested to by trustworthy observers is undoubtedly correct, nothing is left but to assume that that pair of eyes makes use of its *unequal* accommodation, physiologically possible, and thereby enforces the normal binocular act of vision.

Let us next consider the second fact, that anisometropes generally reject perfectly correcting lenses. Schmidt-Rimpler refers thus to the hypothesis of equal accommodation: "If we should endeavor with correcting lenses to transform a myopic or hypermetropic eye into one that is emmetropic, by which the far point is transferred into infinity, we could not wholly succeed, for the relative breadth of accommodation *was* different, and so it will *remain* for the first eye."

Let us examine a little more closely into this generally accepted idea and put it to the test. Let us imagine an anisometrope with h dioptries of Hm in the left eye, and m dioptries of M in the right; let him fix a point p. *cm*. distant, p being greater than the far point p. *r*., of his right eye. In this case the left eye will be the one adjusted dioptrically correct with the assistance of an accommodative effort of $(\frac{100}{p} + p)$D. The right eye accommodates about the same though improperly. The eyes therefore converge upon a

point p, which normal eyes would fix with an accommodation by about h D less. Compared with normal conditions our anisometrope employs in fixing p the normal quota of accommodation plus a positive extent of the relative breadth of accommodation to the amount of h dioptries. If now we let the point p approach to the far point of the right eye, the management in the act of vision (according to prevailing theories) passes over to the right eye, all effort of accommodation ceases, and the eyes converge without any accommodation upon a point $\frac{100}{m}$ *cm* distant which a normal eye would fix with the aid of m D of accommodation. The anisometrope therefore is suddenly able, when the object enters the far point of his right eye, to replace the positive extent of his relative breadth of accommodation with a negative one of m D. In other words he has at command at the far point of his right eye a relative breadth of accommodation of at least $(h + m)$ dioptries. If the object approaches still nearer to p_a, *i. e.* nearer than the far point of the myopic eye, the latter accommodates for p with the necessary quota minus a negative extent of the relative breadth of accommodation to the amount of m D.

We will now correct the anisometropia by lenses of $+ h$ D in the left eye, and of $- m$ D in the right, and first ask the patient to fix an infinitely distant point. This will of course have to be done without accommodation and cannot cause any difficulty, because the anisometrope even before correction with lenses was able to combine a parallel position of the visual axes with repose of accommodation. Let the object next be brought to about $\frac{100}{m}$ *cm*, when a distinct convergence of the visual axes will be combined with an effort of accommodation less by h D than happened before the correction with lenses. In comparison therefore with the former relations of co-ordination, a relative breadth of acccommodation, negative extent, of h D will be demanded. But this must, as has just been shown, have been present to the amount of m D at least before the correction with lenses, and have been in use for the entire region this side of the far point of the myopic eye. If the object now enters that far point an accommodation of m D must be as-

sociated with the same convergence of the visual axes that was employed without accommodation before the correction with lenses. And again this need not cause any difficulties, since, as has just been shown, a relative breadth of accommodation, positive amount, of at least h dioptries has been employed in the immediate vicinity of that point. If the object draws nearer still, the conditions remain the same, since a relative breadth of accommodation, positive extent, of m D is called for, the presence of which for all points on the other side of the far point (right eye) and to the amount of at least h D has already been proved.

So far as I can see, the preceding discussion plainly shows that with approaching equality between the absolute values of h and m, it will not do to grant to the anisometrope after full correction by lenses any greater breadth of accommodation than he had shown before that occurred. For the reply, that the positive extent of a relative breadth of accommodation demanded after correction by lenses must lie on this side of the point $\frac{100}{m}$, whilst before the correction it was only demonstrated for that side of $\frac{100}{m}$, can have no weight, because a pair of eyes that possesses for the point $\frac{100}{11}$ a relative breadth of accommodation of $(h + m)$ D can only lose this extent gradually by the approach or removal of the object. Besides, we must not forget that the demands upon an uncorrected anisometropic pair of eyes vary from the relations of co-ordination that are natural and imbued into mankind, whilst the demands made after correction with lenses are traceable back to the natural co-ordinations.

The state of affairs is different and much more simple when one eye is emmetropic and the other myopic. Then, all the conditions for the corrected and uncorrected pair of eyes would be equal so long as the fixed object lies beyond the far point of the myopic eye. And this region would be the only one to consider in unilateral myopia of 5 D, or even only 4. If the object approaches the far point of the myopic eye, or nearer, the uncorrected pair of eyes makes use of the negative, the corrected pair of the positive extent of the relative breadth of accommodation; the second, how-

ever, would not necessarily follow from the presence of the first. But if we reflect that the myopia is slight, then the positive extent of the relative breadth of accommodation need be but small. If the myopia is greater than 4D or more, the space this side of the far point is as good as not used at all.

In hypermetropia of one eye, and emmetropia of the other, there is no need of alternately using the eyes, and consequently the foundation for this discussion falls out. If we wish to formulate results, we must say: if the view of the alternate use of anisometropic eyes and of symmetrical accommodation is correct, we fail to understand how it is in the vast majority of cases that perfectly correcting lenses are not tolerated. Hence, we are once more compelled to state that, in our opinion, the idea of symmetrical accommodation in anisometropes in general is false, or at least limited to those cases in which perfectly correcting lenses are worn without complaint.

VII.—Cases of Anisometropia Observed.

Case 1.—F. F., æt. sixteen, divergent strabismus; left eye Em, S = 1; right, myopia, — 4D, S = 1; concomitant divergent strabismus of 4 *mm*. On looking far or near, right eye excluded, no matter whether the myopia is corrected or not. No diplopia at the first examination. Bilateral tenotomy reduces the strabismus to insufficiency of the interni. On letting the gaze fall a little the point of indifference lies 0.5 metre before the eyes.

A plain glass, left, and — 4D right, are worn without difficulty. The stereoscope proves that binocular reading is accomplished with this combination. Nevertheless the right half words, although as large, do not seem so distinct as the left. Experiment with accommodation shows right — 4D, left + 3.75D; object at 35 *cm*, prisms of 6° adduction, newspaper read with difficulty. Left half words most indistinct.

With — 4D right, and — 2D left, prisms 18°, distance 35 *cm*, reading still possible, the half words on either side alternate in distinctness.

With right — 4D and left — 2.5D, right half words very indistinct, but still the indistinctness alternates between the two eyes.

The accommodation of the left eye has a range of 4.25D, that at the right, at the most, 2D.

The next point was to find what combination of accommodation was the most natural and suitable in both eyes. If the eyes preferred equal accommodation the most suitable lenses would have been, left eye plain glass, right — 4D, and the half words on both sides would have been equally clear. This was, however, not so, the clearest arrangement for both half words being, left plain glass, right — 2.5D, a result that we can easily comprehend when we consider that, by means of unequal accommodation even with other combinations of lenses, the right and left half words could appear equally distinct.

After proving that the quota of accommodation for reading with the right eye at 35 *cm* was 1.5D less than that in the right, we inquired whether these unequal quotas arose from equal or unequal impulses. And we found the breadth of accommodation in the left eye 10D, and in the right 8.5D; later in the day, left eye 11D, right eye 10.3D.

This variation in one day is not surprising, since the maximum capacity of any muscle is influenced by the freshness or weariness of the entire body, etc. Despite the uncertainty attending these measurements, the accommodation of the left eye was always found to be greater than that of the right.

If we take the accommodation of the left eye at 11D, and that of the right at 10D, then on reading at 35 *cm* with left eye plain glass, and right eye — 2.5D, the left would employ an accommodative effort of 2.85D, *i.e.*, about $\frac{1}{3.8}$ of its entire accommodation. If an equal impulse were sent to the right eye, the latter would also employ $\frac{1}{3.8}$ of its accommodation, *i.e.*, 2.6D. But we found that this was not so, an accommodation of 2.85D in the left eye being associated with only 1.5D in the right. Consequently, F. F., without doubt, when reading at 35 *cm* with both eyes, transmits a stronger impulse to his left eye than to his right; he is an example of Case 2.*a*—unequal impulse, unequal effect.

These experiments suggested this combination: left eye plain glass, right — 2.5D. But as I knew that the accommodation of the eyes could, to a certain extent, act independently, and as it was for the patient's interest to learn to accommodate equally with both eyes, both on account of the latent divergence and for perfecting the optical binocular vision, I let this combination alone, and urgently advised the assiduous cultivation of stereoscopic reading.

Case 2.—Dr. S., æt. thirty-two ; left with + 1.5 + 1.5*c* 25° *n*, S = $\frac{5}{12}$; right — 4D, S = $\frac{5}{5}$.

Near point, left 22, right 9 *cm ;* breadth of accommodation left 6.05D, right 7.1D.

Dr. S. wears plain glass left and — 4D right without trouble. The diminution of sight in left eye is due to a leucoma ; latent divergent squint ; stereoscope, large newspaper type binocularly without prisms at 40 *cm* with his usual glasses. If the anisometropia is fully corrected, the smallest type can be read more fluently at 40 *cm* without prisms than the coarser type before. In so doing, left half words less distinct than the right, due as much to reduced sight in the left eye as to unequal breadth of accommodation in both eyes.

To test the latter, reading was tried in left eye with + 2.5 + 1.5*c* 25*n*, and right — 4D, a combination with which binocular vision was better than before, but the proportional indistinctness of the left half words persisted. After the patient had looked about the room for a while with the last combination he complained of asthenopia, and said that this very feeling had often before prevented his wearing correcting lenses. I said that a prism would help that, and on placing 24° base out before one of the eyes he exclaimed "Ah, what a relief." This seems to confirm my opinion that the asthenopia during full correction is due to the latent divergence, and that he could use such lenses if he compensated for the tendency to diverge with a prism. But as he was satisfied with his present lens no change was made.

The breadth of accommodation in the myopic eye was, as Hock asserts is the rule,[1] the greater. If now we examine these two cases, we find that the eye most often employed in the act of vision had the greatest breadth of accommodation ; and this eye was the weaker refracting (emmetroic) in one case, and the stronger refracting (myopic) in the other.

Case 3.—Prof. W., æt. 52, wishes a glass for medium distances ; he does not generally wear a glass, reads with his myopic right eye, and aims with the same (when gunning) with lens. He complains of asthenopia when looking at pictures, into show

[1] Propædeutik der Augenheilkde., 1887, p. 57.

cases, and lately at his chemical labels, when discomfort and headache ensue in half an hour or so.

Left, Hm 1.5D, right S = $\frac{5}{6}$, accommodation 2D.

Right, M. — 2.5D, S = $\frac{5}{6}$, accommodation 1.2D.

Slight latent divergence on bringing an object up to 25 *cm*; breadth of accommodation greater in the eye with less refraction.

The patient's complaints are easy to explain; he uses his left habitually, but increasing presbyopia only permits this when the object is quite far off or does not need to be steadily observed. If this condition of things is not fulfilled, the hypermetropic eye is obliged to accommodate too strongly, whereupon asthenopia ensues. For close work the myopic eye is employed, and the hypermetropic refused, although it is correctly directed.

Stereoscope; distance 50 *cm*, adduction prisms 18°.

1. Right eye — 0.50D, left + 1.75D; left half words about as clear as the right; with — 0.5D, right — 2D left, left half words are clearer than the right.

2. With right — 1.75D, left + 1.75D, left words less distinct than right; with right — 1.75D, left + 2D, left words the clearer.

Explanation: when the test stood at the far point of right eye (with lens) and also when it stood in its near point, the maximum accommodative effort of the left eye could almost be employed, *i. e.*, the left eye accommodated almost to its maximum without the right eye being compelled to accommodate at all.

On the next day: accommodation 2D left, 1.5D right.

Stereoscope: 50 *cm*, prisms 18°;

1. Left + 3.5D, right 2D; half words right and left alternately indistinct;

With left + 3.5D, right — 2.25D, right half words more hazy.

2. Left + 1.75D, right — 1.75D, right half words clearer;

With left + 1.75D, right — 2 D, right half words somewhat more distinct;

With left + 1.75D, right — 2.25D, right half words a trifle more hazy than the left.

In other words, the right eye employs its maximum accommodation in binocular combined reading, no matter whether the object stands at the far point of the left eye (experiment 1), or at its near point (2).

On the third day, the reading test showed that on holding the test at 35 *cm*, an accommodation of 0.35D, a third or fourth of the

entire amount in the right eye, was combined with 2D (the entire accommodation of the left eye). Bearing in mind this complete independence of the eyes, I directed + 2D left, and — 2D right, with which a scope of from 40 *cm* to 200 *cm* is commanded without asthenopia.

VIII. Conclusion.

The axiom that unsymmetrical accommodation is impossible, up to this day the foundation-stone of the chapter on anisometropia, even in the most recent text-books on ophthalmology, is false and must be erased. Into its place steps the fact that even under physiological conditions the accommodation of one eye can act independently of that of the other, independent, however, only within certain limits. But this unequal accommodation can only be obtained by a perceptible and sometimes a painful exertion, and the eyes only bring it into use in so far as it is indispensably necessary in the interest of the act of vision. When, *e. g.*, we have an artificial difference of refraction amounting to 1D, the eye compensates for ¾ of this by unequal accommodation, and lets the defect of 0.25D count for nothing, because this amount does not prevent the reading of a certain type at a certain distance. It is the non-consideration of this fact that has led Donders astray. For when in his reading experiment eyes, made anisometropic by lenses, do not see the print distinctly, we can only conclude that the *entire* difference in refraction was not compensated for by unequal accommodation, whilst Donders concluded that unequal accommodation was on the whole impossible.

Let us now look at anisometropes from the point of view that unsymmetrical accommodation is possible, and

1. at those who exclusively use one eye, and suppress or neglect the images in the other. Neither of these steps *necessitates* any squint. We often see persons with the sight of one eye reduced by corneal cicatrices or other causes, yet both eyes are directed at the object. The same occurs despite high degrees of anisometropia. Further still, the indistinct retinal image of one eye can be added to

the well defined one of the other, and be of use in binocular and stereoscopic vision, as Van der Meulen[1] has noticed and as Prof. Fick writes to me: "I am more myopic in the right eye than the left. If I hold writing matter further off than the far point of my left eye, and close the right I of course see indistinctly, but if I now open the right eye I see better. Hence the poorer can aid the better." In all such cases, whether the one eye is exclusively used, and the other, whether squinting or not, neglected, or whether the worse eye assist the better despite imperfect retinal images, the accommodative impulse can be:

α. equal for both eyes, or

β. partly or entirely confined to the better eye.

Case α will be granted if the original physiological condition of symmetrical accommodation continues. Case β would be an adaptation to the special conditions of the case, in so far only as an active interest is taken in the accommodation of the better eye. Both of Werth's observations prove that case β also occurs, in so far as the vision of the neglected and non-accommodating eye was considerable in both cases.

2. The anisometrope uses his eyes alternately, the one with weaker refraction for far, the stronger for near. Here also α and β are possible. Here, too, the occurrence of β, *i. e.*, isolated accommodative impulse to either eye, or to the fixing eye, is proved, *e. g.*, in the two cases described by Fuchs. He has at least proved that in reading at a short distance (use of the eye with the stronger refraction) the one with weaker refraction was not accommodated at all. But he did not investigate the question, whether on using the eye with weaker refraction the myopic eye continued in a state of accommodative rest.

3. The anisometrope has about the same acuteness of sight in both eyes, and binocular vision in the full sense of the word. Here the question arises, whether the *breadth* of accommodation in both eyes is alike. If such is the case, and the *impulse, too*, alike in both eyes, only one eye will get sharp retinal images, no matter at what distance the ob-

[1] *v. Graefe's Archiv*, Bd. xix., 1.

ject lies. These cases include all persons who tolerate the full correction of their anisometropia.[1]

The number of these would be still greater if we could have considered that the asthenopia originating from complete correction of the anisometropia is of a muscular nature, and is curable by the employment of proper prisms. Dr. S. may serve as an example, leaving aside the variation in the breadth of accommodation in the two eyes.

When the breadth of accommodation is equal in both eyes but the impulse unequal, the anisometrope will partly or entirely compensate for this over certain tracts. Probably the majority of anisometropes with good sight in each eye belong to this group. Complete correction will not be tolerated, not because the patients are accustomed to indistinct retinal images in one eye, but because a different quota of coordination, one proportional to the quota of accommodation, has worked itself out and become habitual.

Finally, the *breadth* of accommodation may vary considerably:

α with symmetrical,

β with unsymmetrical, or even entirely independent accommodative impulses.

My cases were in this class; F. F. had a little more accommodation in the emmetropic eye than in the myopic, but the impulse sent to the emmetropic eye was much the greater. Both of these circumstances acted together in the same direction, partly compensating for near work the anisometropia present. In Dr. S. the accommodation of the myopic eye was the greater, the impulse presumably equal in both eyes. In Prof. W., the breadth of accommodation in the weaker refracting eye (the one habitually used) was greater than that of the myopic eye. The stereoscope showed that the accommodation of the left eye was active,

[1] Leduc, "Contribution à l'Étude de l'Anisometropie," Paris, 1883, says that correction of anisometropia will only be permitted up to a difference of 1.5D between the lenses, and yet he then instances a case with a difference of 3D. Theobald (*Am. Jour. of Ophth.*, 1884) has seen one with a difference of 4D. Leduc is much exercised about the different magnitude of the retinal images in such a case, but our patient, F. F., despite correction of his unilateral myopia of 4D, could not perceive any difference in the size of the right and left half words. There is always considerable scope for identical localities in the retina. See van der Meulen, *loc. cit.*

whilst that of the right was at rest, and *vice versa*. We therefore argue that both eyes were not only used for various instances, but accommodated independently of one another. Nevertheless, the advanced presbyopia prevents us from proving this by Werth's method.

My experience is too small to establish any rules for fitting anisometropes with lenses. I will simply say that the following points must be considered:

1. The breadth of accommodation in both eyes singly.
2. The variation of accommodation in one eye when that of the other remains, as far as possible, unchanged.
3. The alterations of refraction needed for the least trying combined binocular reading.

From these points we can easily discover what lenses people will tolerate, in which step of course we are to bear in mind that complete correction is our aim. The subjective sensations of the patient will then be proof of the correctness of our calculations, whilst hitherto they have been our only guide, and that has been far from trustworthy.

IX. Supplement.

During a discussion on this paper, the question arose whether an eye could accommodate with unequal force in different meridians. The question has often been answered affirmatively when pathological conditions were concerned; *e. g.*, corneal astigmatism has often been compensated for or increased by astigmatism of the lens, whilst the latter has disappeared after atropine. If these observations are correct, the healthy eye can accommodate asymmetrically in different meridians. I tested this by placing Sn 1 at the far point of my right, myopic eye (— 2D), and added — 2D,c axis horiz. As I am slightly more myopic in the vertical meridian than in the horizontal, the type at once became a little more indistinct. But when I placed the cylinder with its axis vertical, I could no longer read the test. I next made a certain indescribable exertion, and at once the type cleared up so that I could read it fluently. But I had to pay for that exertion by a feeling of discomfort lasting several days. As I might possibly have squeezed my lids together invol-

untarily and scattered the circles of diffusion, I repeated the experiment with M. F. His emmetropic right eye was armed with + 2D, and with successively stronger cylinders up to — 3.5D axis horiz.; reading distance, 52 *cm;* with — 3.5D, the type is of course completely effaced. After an exertion in which all contraction of the lids was avoided, the type became for a few seconds and at rapid intervals so distinct that a few words in succession could be read. A few experiments of this sort cause a disagreeable sensation in the eyes.

I therefore acknowledge that meridional asymmetrical accommodation is possible, and I believe that the asthenopia of many astigmatics is caused by the effort to compensate for the corneal astigmatism, by meridional asymmetrical accommodation.

THE CAUSE OF SENILE CATARACT.

By Dr. W. SCHOEN, of Leipsic.

(*With plate iii. of vol. xix., German edition.*)

Translated by Dr. J. H. Shorter.

IN my article on the cause of senile cataract, in these ARCHIVES (vol. xvii., p. 33, etc.), I promised a clinical résumé of cataract cases, with reference to the ætiology thereof. I am now able, in place of this, to present some considerable statistics. In connection with this subject, as with that of glaucoma, it is well to keep in mind the fact that, in order to find out the cause of an occurrence, it may not be sufficient to alone investigate or study the disease as fully developed, but may be particularly necessary to find out the beginnings thereof. From an anatomical standpoint, the arrangement of the beginning cataractous process could be referred to the zonula fibres, and hence to the accommodation. Therefore, here again it was the eye overtaxed in accommodative effort, in which it was necessary to seek for it.

Commencing cataract was found in unexpected numbers. Examination with the plane mirror first employed did not suffice to discover the very first beginnings. These became visible only by oblique illumination after dilatation of the pupil (homatropia).

One must not be deceived by the reflex from the border of the lens. The first sign of commencing equatorial cataract is not a diffuse opacity, but always consists in delicate, sharply defined white or grayish-white dots and streaks lying in or

directly under the capsule, just behind or 1 *mm* in front of the equator. The process does not commence with clefts, which is Becker's opinion. The beginnings have thus far, in fact, escaped observation for the reason that it has been always customary to look for cataract only in the eyes of old people. The first dots and streaks are found chiefly in the horizontal meridian outward and inward. Later on a posterior and anterior streak combine to form a roof-rider. When the wreath of these has been completed around into a circle there is presented on the lens capsule, in relief, a picture of the arrangement of the zonula fibres through the aggregation of circumscribed capsular inflammations. Later the fold formation also begins. The two figures on plate iii. show an enlarged micro-photographic duplicate of individual fibres from the same specimen which is pictured in plate i. of the above-mentioned dissertation. There are medium zonula fibres directly behind the equator, which latter lies to the left in the plate. In fig. i. the fibre-bases are surrounded by cells with strongly pigmented nuclei; between them lie single cells, which are changing into vesicular cells.

In the second figure a lifted-up fold from the lower fibre stretches out towards the equator. Looking at the figure with one eye, I receive a plastic impression, such as from the specimen itself. On the folds stand cells, with large visible nuclei closely crowded to each other. Under the capsule are found, corresponding to the ends of these fibres, small and attenuated nests of vesicle cells. During life there were probably visible at the place of the fibre-base in fig. i. a small point, and, at the place of the elevated fold in fig. 2, a fine streak in the posterior seam.

I am of the opinion that the process, at any or every degree of the incipient stage described (that is, so long as it concerns the sharply defined points, streaks and roof-riders without fold-formation or elevation of the capsule), may remain stationary, although I would not yet venture to make the statement as a certainty. It gives me the impression that cases of cataract would apply for operation much more frequently if in all these eyes they developed to ma-

turity. The further process of development now diverges. Either the streaks and spots run together into roof-rafters or seams and the cell proliferation spreads out towards the centre of the anterior capsule, in which case may be often observed a radiate arrangement of rows of dots, or, secondly, the elevation of the capsule advances in radiate folds, and clefts now occur in the equatorial cortex, or, thirdly, the capsule becomes lifted up along the entire equator, so that a second contour is seen encircling the lens; then nuclear sclerosis develops. The nucleus is seen separated, surrounded by transparent cortex, and with the wreath of roof-rafters around the equator (which is never absent), as also the contour of the detached capsule. These three types of later cataract development may be associated together.

Of 5,642 eyes treated during recent years, 4,030 were examined ophthalmoscopically, and the sight tested. The remainder were externally diseased. This number of special eye cases forms the basis of the statistics. There were in the whole number 441 cataractous eyes, which, as the following table i. and the accompanying figure show, were distributed amongst different ages. It is a discovery that the larger number of beginning cataracts exist already in early years of life. The percentage increases constantly with age.

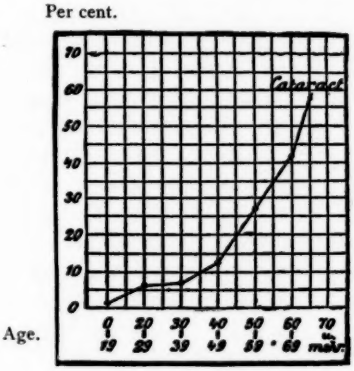
Sex had hardly any influence. There were in 123 men 209 cataractous eyes, and in 124 women 232. Of the men, the majority were engaged in clerical work, a smaller portion belonged to the industrial or mechanical classes. The women are housewives, seamstresses, or engaged in other industrial work. Amongst the males, firemen, or workers at fire, were found only in minimum quantities. Amongst the women there was no case of those engaged in work about fire, excepting that of the domestic hearth or in laundries. Secondary, diabetic, and congenital cataracts are excluded from the statistics.

In the great majority of the eyes, viz., 391, the equatorial cataract in the above-described form is distinctly demonstrated. Diffuse cortical cataract is associated in large numbers with the equatorial cataract only after the age of 50; nuclear sclerosis first in 2 cases after 60, and in 12 after

70 years of age. There is no case of nuclear sclerosis without equatorial cataract. The cataract processs always commences with equatorial capsulitis. In youthful years the first beginning is seen as stripes and dots in both seams, seldom as a complete roof-rider wreath. The process is exactly the same, whether it begins in young or old eyes. In 89 eyes = 23 %, the first beginnings were seen, *i. e.*, isolated spots and stripes.

Division of cataractous eyes, amongst the whole number of eyes examined, according to the different ages:

Age.	Up to 19	20 to 29	30 to 39	40 to 49	50 to 59	60 to 69	Above 70	Total.
Eyes examined.	1213	898	590	613	428	210	78	4030
" cataractous.	19	52	46	75	117	88	44	441
Per cent. . . .	1.5	5.8	7.8	122	27.4	41.9	57.8	10.9



The period of incipiency shows the highest per cent. among the cataracts of persons aged 20 years. But from year to year this incipient stage diminishes in favor of the more advanced forms. The upper part of the lens is not seen in a single case as the first seat of the disease.

The second stage of development (*i. e.*, more or less complete seams and roof-rider wreaths) were found in 236 eyes. The rate per cent. advanced up to the age of 70, and then dropped a little.

In the third stage, in which the cortical lying adjacent to the axis is also implicated in the equatorial cataract, there are 42 eyes. This stage first finds representatives after the age of 30 years. As a rule, the opacities can be traced continuously from the equator, whether consisting of coalescing spokes, or whether they appear as rows of dots arranged in a radiate order. Polar cataract very seldom appears before these rays reach the axis. By this time the proportionately earlier detachment of the equatorial capsule has led to interference with the nutrition, which, in increasing ratio after 60 years of age, causes nuclear sclerosis.

The different conditions of refraction showed cataract as follows: In the first cases, that is, of those in more youthful age, hypermetropia and astigmatism occupied always the lion's share. Usual astigmatism (*i. e.*, that in which the vertical meridian is the most refractive) when not corrected carries with it always great danger of cataract. In astigmatic eyes, even of young people, which have been overtaxed by working without correcting glasses, one seldom fails to find the first signs of equatorial cataract.

Up to the age of 30, astigmatism is found in half the cases of cataract. In the cases between 10 and 20 astigmatism according to the rule outnumbers that which is against the rule four to one, whereas in the fiftieth year both are about equally numerous. Beyond the 60th year of age astigmatism against the rule predominates fivefold over that which follows the rule. The proportion has become changed into exactly the opposite.

All eyes affected with glaucoma simplex or subacutum had at the same time equatorial cataract.

As to the question of heredity and of frequency of cataract in certain families, my experience demonstrated that the families were all hypermetropic and astigmatic. The individual members and generations always showed, in addition to the cataract, the one or the other symptom of overtaxation of accommodation.

From my investigation the following conclusions may be drawn:

1st. The process heretofore distinguished as senile cataract begins always as equatorial cataract, with fine white dots and streaks (never with clefts).

2d. Nuclear sclerosis never appears without equatorial cataract. On the other hand, the statistics show 377 eyes with equatorial cataract without nuclear sclerosis. The latter is without doubt secondary.

3d. Nuclear sclerosis is associated with equatorial cataract first after the ages of sixty (two cases) and seventy (12 cases).

4th. More than half (60 %) of the patients with cataract have still normal acuteness of vision, wherefore changes in the centre of the lens may be excluded.

5th. Anterior cortical cataract is rarely associated with equatorial cataract before the age of 50.

6th. Cataracta simplex is not peculiar to old age, but frequently occurs in its incipiency in young people from 20 to 30 years of age. The designation "senile" should therefore be dropped and "simplex" be employed in its place.

7th. Three fourths of the total number of cataractous eyes are hypermetropic or astigmatic.

8th. Equatorial cataract begins chiefly in the horizontal meridian.

9th. The macroscopic dots and stripes correspond to the insertion of the anterior and middle zonular fibres.

10th. The microscopical changes likewise are arranged around the base of these fibres.

EXCESSIVE HEMORRHAGE FOLLOWING THE EXTRACTION OF CATARACT.

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THE question of serious hemorrhage never enters, possibly, the mind of the operator as a consequence of the extraction of cataract. Certainly I have never anticipated such result. Not long ago, however, I read in the *New York Medical Record* that Webster had had troublesome hemorrhage following extraction. I saw Webster later, and he told me he thought the hemorrhage came from the vessels of the fundus, and that it was due to relaxation. If my memory serves me correctly, I think I can recall one other case, but by whom reported I cannot state. At any rate it must be admitted that dangerous hemorrhage in the operation mentioned is not a factor to be considered. However, in April I extracted a cataract in a woman, Nancy Taylor by name, aged 65, by the usual modified Graefe incision. A portion of the iris protruded through the corneal incision, and after manipulating it for a few minutes and failing to replace it I decided to clip it off. No more blood than usually follows escaped for two minutes; after that there was a gradually increasing flow from the cut edge of the iris. It required only a few moments of such hemorrhage to fill the anterior chamber, and distend the wound. The operation was performed at 1 o'clock P.M., and the hemorrhage was checked at 9 o'clock that night. After all hopes of saving the eye were abandoned, I applied ice compresses which finally checked

the bleeding at the hour mentioned. The hemorrhage became quite free at times—so much so that my patient was seriously exhausted, and I somewhat alarmed at the consequence. Panophthalmitis set in, and the eye went the usual way.

If any such serious hemorrhage has been previously recorded I have failed to find it.

I was assisted in the operation by Dr. R. Fraser Michel of this city.

SYSTEMATIC REPORT ON THE PROGRESS OF OPHTHALMOLOGY DURING THE FOURTH QUARTER OF THE YEAR 1888.

By H. MAGNUS, Breslau; C. HORSTMANN, Berlin; and A. NIEDEN, Bochum.

WITH THE CO-OPERATION OF

S. M. Burnett, Washington; Dantone, Rome; Hirschmann, Charkow; E. Marckwort, Antwerp; P. v. Mittelstädt, Metz; L. Werner, Dublin; C. H. A. Westhoff, Amsterdam; Schjötz and Ole Bull, Christiania, etc.

Translated by F. E. D'Oench, M.D., New York.

Sections I.–III. Reviewed by Prof. H. MAGNUS.

I.—GENERAL OPHTHALMOLOGICAL LITERATURE.

a.—TEXT-BOOKS, MONOGRAPHS, TREATISES ON GENERAL BIBLIOGRAPHICAL AND HISTORICAL SUBJECTS.

423. Bickerton. Sailors and their eyesight. *Brit. Med. Journ.*, Nov., 1888, p. 1038. Report on two accidents at sea, caused by defective sight of seamen.

424. Decren. Quelques aperçus des maladies oculaires que l'on rencontre aux Indes hollandaises orientales. *Rec. d'ophth.*, Dec., 1888, p. 705.

425. Hutchinson. Cases illustrating questions in diagnosis and treatment. *Royal London Ophth. Hosp. Rep.*, vol. xii., part 2, p. 61.

426. Simi. L'oggi dell' oculistica. *Boll. d'ocul.*, vol. x., 18–19, p. 125.

DECREN (424) describes the eye-diseases which he observed in his capacity as military surgeon in the Dutch possessions in India. He found no cases of myopia among the inhabitants of Java, which he explains by the fact that they do not learn either to read or write. Neither did he observe primary glaucoma among them. Blennorrhoic conjunctivitis is very common among them, also keratitis parenchymatosa, syphilitic iritis, and sympathetic ophthalmia. MARCKWORT.

HUTCHINSON (425) describes several of the cases observed by him, for instance one of blow upon the eye with subsequent blindness (Magnus has described a similar one in the *Klin. Monatsbl. f. Augenhk.*, 1887,); ulceration attended with paroxysms of pain; specific retinitis in early childhood; various forms of affections of the optic nerve. WERNER.

SIMI (426) contends against the too extensive use of the ophthalmic institutions for scientific purposes to the detriment of clinical studies, thereby producing very learned professors, but very few practical young oculists. DANTONE.

b.—STATISTICAL PAPERS.

427. SALTINI. Primo rendiconto clinico. Parma, 1888.

At the Parma ophthalmic clinic in charge of SALTINI (427), 3,626 eye-patients were treated in 1887–88, and 296 operations were performed (among them 45 extractions of cataract and 102 iridectomies). DANTONE.

II.—GENERAL TREATMENT AND DIAGNOSIS.

a.—GENERAL TREATMENT.

428. ABADIE. De l'iridectomie. Nouveau procédé opératoire. *Ann. d'ocul.*, vol. xcix., p. 261.

429. KAZAUROW. Exenteratio (evisceratio bulbi). *Wratsch.*, 1888, No. 48.

430. PRINCE, A. E. Pain after evisceration. *Amer. Journ. Ophth.*, 1888, No. 6.

431. ROPER. Enucleation of the eyeball, with intra-orbital injection of cocaine. *Lancet*, 1888, p. 172.

ABADIE (428) in distinction from de Wecker, excises a triangular piece from the diaphragm formed by the iris and secondary cataract in the following manner: A corneal wound is made simultaneously above and below. The pince-ciseaux are intro-

duced as usual in such a manner into the middle of the lower wound that the sharp point penetrates the iris and two cuts are made diverging from the middle of the corneal wound. A toothed forceps is then introduced into the upper wound, the flap in the diaphragm seized, pulled out and cut off. MARCKWORT.

KAZAUROW (429) describes his modified method: After abscising the anterior part of the globe the contents are removed under spray with a 3 % solution of carbolic acid. The whole inner surface of the sclera is then cauterized with the galvano-cautery. The object of this is: (1) to check the hemorrhage; (2) destruction of particles of retina and choroid which may have been left behind; (3) as thorough antisepsis as possible and occlusion of the vorticose veins. The pain usually following evisceration was not felt when the cautery had been used. Iodoform is blown into the scleral cavity and the closed lids are bandaged with sublimated cotton. No sutures are introduced. HIRSCHMANN.

PRINCE (430) found that cauterizing the inner surface of the sclera with carbolic acid not only relieves the pain after the operation to a great extent, but is also the best antiseptic for preventing the spread of septic substances to the brain. BURNETT.

432. CONNER. Hot water in the treatment of eye-diseases. *Trans.* 9th *Internat. Med. Congr.*, 1887.

CONNER (432) concludes, from long experience in the application of hot water in all kinds of eye-diseases, that it is the most valuable remedy we possess for treating inflammatory diseases of this organ. By hot water he means water between the temperatures of 40° and 60°C. The method of applying it is very simple. The water is contained in a goblet, and the eye is dipped into it for five to ten minutes, or as long as may be desirable. He asserts that this method is superior to any other of applying moist heat. He calls attention to the fact that it quickly kills germs.

BURNETT.

b.—GENERAL DIAGNOSIS.

433. BAKER. Retinoscopy. *Trans. 9th Internat. Med. Congr.*, 1887.

434. CHODIN. On retinoscopy (skiascopy). *Wjestnik Ophth.*, July–October, 1888.

435. CROSS. Retinoscopy. *Trans. 9th Internat. Med. Congr.*, 1887.

436. LEROY. Sur la théorie de l'ombre pupillaire. Réponse à M. le Pr. Monoyer. Réfutation de la théorié de Landolt. *Rev. génér. d'ophth.*, Nov., 1888, p. 494.

BAKER (433) defends retinoscopy as being a scientific and exact method of determining refraction. For reasons not sufficiently clear he prefers the concave to the plane mirror.

BURNETT.

CHODIN (434) calls attention to the advantages of retinoscopy for the objective determination of refraction, the accuracy of such determinations to within 0.50 D and even 0.25 D, and recommends the use of this method, hitherto seldom employed in Russia and Germany. HIRSCHMANN.

CROSS (435) is an enthusiastic admirer of retinoscopy, and depends upon it almost exclusively for the objective determination of refraction. He presents a review of 462 recorded cases.

BURNETT.

III.—INSTRUMENTS AND REMEDIES.

437. ANDREWS, J. A. An attachment for Agnew's bident. *N. Y. Med. Jour.*, Nov. 24, 1888.

ANDREWS (437) has affixed a removable handle to the bident devised by Agnew for holding a dislocated lens in place previous to its extraction. The handle makes the manipulation of the needle easier and safer. BURNETT.

Sections IV.—IX. reviewed by PROF. HORSTMANN.

IV.—ANOMALIES OF REFRACTION AND ACCOMMODATION.

438. CHAUVEL. Myopie et astigmatisme. *Soc. d'ophth. de Paris*, Oct. 2, 1888.

439. COLEMAN, W. F. The determination and treatment of hypermetropia. *Jour. Amer. Med. Assoc.*, Dec. 29, 1888.

440. GUNN. Peculiar foveal reflex in connection with amblyopia in myopia. *Trans. Ophth. Soc. Unit. Kingd.*, vol. viii., p. 173.

441. HEWETSON. General neurosis having an ophthalmic origin. *Brit. Med. Journ.*, 1888, p. 1073.

442. MAXWELL. Chronic nasal catarrh as a reflex cause of accommodative asthenopia. *Ophth. Rev.*, vol. vii., p. 305.

CHAUVEL (438) discusses the paper of Martin, in which the latter attributes an important influence to astigmatism in the

development of myopia and posterior staphyloma. This view Chauvel opposes. Meyer, Parent, Abadie, and Galezowski more or less agree with Chauvel. Meyer asserts that astigmatism can only indirectly produce an increase of myopia, the same as, for instance, opacities of the cornea, by reducing vision and thereby causing the object to be brought nearer, thus necessitating greater convergence, which again contributes to the development of myopia. For this reason the correction of the astigmatism becomes very necessary. MARCKWORT.

COLEMAN (439) thinks that it is necessary to paralyze the accommodation in order to prescribe the most suitable glasses in H. He does not think the accommodation can be thoroughly paralyzed by homatropine. He also thinks that the total or nearly total anomaly should be corrected at once. BURNETT.

GUNN (440) saw a fan-shaped reflex at the macula, the apex towards the fovea, in a boy aged 12, with a myopia of 9 D, whose V after correction was $\frac{6}{18}$. The reflex had a whitish metallic lustre, and seemed to extend into the vitreous. WERNER.

HEWETSON (441) mentions several cases in which astigmatism caused headache, which disappeared when the correct glasses were prescribed. WERNER.

MAXWELL (442) found that in many cases of accommodative asthenopia, of inflammatory conditions of the conjunctiva and lids, and of aural affections, the cause was found in some disease of the nose or pharynx. He mentions four cases. WERNER.

V.—LIDS.

443. BENSON. On the treatment of entropion and trichiasis by the transplantation of buccal mucous membrane. *Ophth. Rev.*, vol. vii., p. 303.

444. FUCHS, E. The inflammation of the margin of the lids. *Wiener klin. Wochenschr.*, 1888, Nos. 38 and 39.

445. GARRARD, W. A. Punctured wound of upper eyelid, followed by complete palsy of third nerve and optic-nerve atrophy. *Trans. Ophth. Soc.*, vol. viii., p. 277.

446. GILLET DE GRANDMONT. Opération de l'entropion fonctionnel. *Soc. d'ophth. de Paris*, December 4, 1888.

447. DOR. Colobome congénital des paupières. *Rev. génér. d'ophth.*, 1888, p. 529.

448. HUTCHINSON, J., Jr. Syphilitic disease of the eyelids. *Ophth. Hosp. Rep.*, vol. xii., 2, p. 156.

449. HUTCHINSON, J. Solid and persistent œdema of the eyelids and face. *Illustr. Med. News*, 1888, No. 4, p. 82.

450. KOHAN, M. B. Entropium operation on the upper lid. *Wjestnik Ophth.*, 1888, Nos. 4 and 5, p. 329.

451. MEIGHAN, T. S. On the treatment of symblepharon by transplantation of mucous membrane from the lip. *Ophth. Rev.*, vol. vii., p. 304.

452. MCHARDY. A case of combined anchylo-blepharon and partial symblepharon cum cornea. *Illustr. Med. News*, 1888, Nos. 1 and 3.

453. DE SCHWEINITZ, G. E. Fugitive œdema of the eyelids. *Amer. Jour. Ophth.*, vol. v., 6, p. 173.

454. VERNEUIL et CLADO. Sur la presence des microbes dans les kystes dermoides congénitaux de la face. *Gaz. hebdom.*, 1888, No. 51, p. 814.

According to FUCHS (444) there are two kinds of blepharitis: the ulcerous and squamous. The latter he calls seborrhœa of the margin of the lids; when attended with the formation of bran-like scales, he designates it as seborrhœa squamosa s. sicca, and when attended with the formation of crusts, seborrhœa ulcerosa. The latter he considers an eczema, which is accompanied with suppuration of the hair-follicles.

GARRARD (445) reports a case of injury of the upper lid, followed by paralysis of the oculomotor, which was cured; subsequently atrophy of the optic nerve developed. Probably the wound extended into the orbit. WERNER.

GILLET DE GRANDMONT (446) discusses the senile entropium of the lower lid. As he succeeded only partially or temporarily with the methods in general use in cases of senile entropium, he has now adopted the following method: Two needles upon an aseptic thread are passed through the fornix of the lower conjunctival sac 6 to 8 *mm* apart, through the skin 3 to 4 *mm* apart, then out 3 to 4 *mm* from the edge of the lids, and finally firmly tied. The same process is repeated upon the lower lid with two more pair of needles, so that the knots of the three threads lie in a line parallel to the edge of the lid. The threads may remain from two to three months without causing irritation (?), and fall out of their own accord, or they may be cut as soon as one is sure that the skin has become united with the deeper parts of the lid. Gorecki calls attention to the fact that the threads must be passed *under* the tarsus. MARCKWORT.

Dor (447) reports another case of bilateral congenital coloboma of the upper lids with symblepharon. In discussing the etiology, Dor attacks the theory of van Duyse, and asserts that the coloboma is due to an arrest of development at the stage of fœtal life, at which the lids do not as yet exist. The frequent simultaneous existence of coloboma of the lids, harelip, and cleft palate indicates a common cause, which he thinks will be found in the pathological anatomy of the facial clefts (*cf.* Morian, *Arch. f. klin. Chir.*, 1887, vol. xxxv.). Marckwort.

Hutchinson, Jr., (448) describes the following cases: (1) Ulceration of the margin of the lid during the second stage of syphilis; (2) repeated attacks of chemosis, also during the second stage; and (3) repeated ulceration and infiltration of the upper lid during the tertiary stage. In the last-mentioned case there was a gumma of the upper, which Hutchinson at first mistook for a chalazion. He believes that affections of the lids are very common in the secondary and tertiary stages, especially when rupia and ulcers of the palate exist. The upper lid in particular will then be attacked. Tertiary affections are more common in women than in men. Werner.

Hutchinson (449) reports two cases in which a firm œdema of the lids and face remained behind after repeated attacks of erysipelas. The disease differed from elephantiasis only through the fact that the thickening seemed uniform. Werner.

McHardy (452) describes a case in which the upper lid became united with the cornea after combustion with lime. Teale's operation gave a good result. Werner.

The case of de Schweinitz (453) was that of a woman with liver complaint, who was engaged in literary work. No affection of the uterus and kidneys. After severe pain in the region of the right supraorbital nerve œdema of the eyelids of the right eye and of the right side of the forehead developed. It disappeared after the application of hot compresses and Basham's mixture (mixt. ferr. et ammon. acetat., U. S. Pharmacop.). It returned three times, once without any preceding pain. Right eye: Hyperopic astigm., 0.5, 15° t. Burnett.

Verneuil and Clado (454) examined four dermoid cysts for microbes. The wall was free in all of them, but the result of the examination of the contents was doubtful in only one, microbes being found in the other three in varying number; cultures and inoculations succeeded. Marckwort.

VI.—LACHRYMAL APPARATUS.

455. DE BRITTO, V. Note sur un cas de tumeur de la glande lacrymale. *Arch. d'opht.*, 1888, No. 6, p. 547.

456. SECONDI, E. Epitelioma papillomatoso della caruncula lacrimale. *Giorn. di R. Accad. di Med. di Torino*, vol. li., 12, p. 484.

457. VALUDE. Essais de tuberculisation expérimentale du sac lacrymal. *Progr. méd.*, 1888, No. 31, p. 50.

458. WILLIAMS. Suppurative dacryocystitis caused by jequirity. *St. Louis Med. and Surg. Journ.*, 1888, No. 3, p. 168.

DE BRITTO (455) saw in a young man aged thirty a tumor occupying the whole opening of the right orbit, which had developed in the course of seven years. It sprang from the upper outer wall of the orbit, and ended near the corneal margin. The eye, the sight of which had been but little impaired, was dislocated backward and down-and-outward. On account of the position of the tumor and the backward dislocation of the eyeball, the author made the diagnosis of a tumor of the lower lachrymal gland, as a tumor of the upper, from anatomical reasons, would cause exophthalmus. The extirpation was performed from the lid. Recovery after twenty days, leaving a little ptosis. No diplopia. Two illustrations show the condition before and after the operation. The tumor proved to be a fibro-adenoma.

V. MITTELSTÄDT.

VALUDE (457) inoculated the lachrymal sac of both sides with tubercle-bacilli in ten rabbits. In only three cases a tuberculous nodule developed in the surrounding tissue, as a small quantity of the injected liquid had penetrated into it. The mucous membrane remained normal in every case. Valude concludes, from these and previous experiments, that the normal tears contain micro-organisms which prevent the development of the tubercle bacilli. In this manner he explains the rare occurrence of tuberculosis of the conjunctiva. MARCKWORT.

VII.—MUSCLES AND NERVES.

458*a*. COLLINS, W. J. Case of paralysis of sensory branches of right fifth nerve with cataract, and without any corneal change. *Trans. Oph. Soc. Unit. Kingd.*, vol. viii., p. 254.

459. EMRYS-JONES. An unusual complication after subconjunctival tenotomy of the internal rectus. *Trans. Oph. Soc.*, viii., p. 383.

460. Gioux. Contribution à l'étude de l'insuffisance des muscles de l'œil et de leur traitement par la tenomyotomie partielle. *Thèse de Paris*, 1888.

461. Jones, W. M. Miners' nystagmus. *Brit. Med. Journ.*, December, 1888, p. 1398.

462. Rockliffe, W. C. Note on partial ophthalmoplegia treated with large doses of iodide and mercury. *Trans. Oph. Soc. Unit. Kingd.*, vol viii., p. 283.

463. Savage, G. C. The harmonious non-symmetrical action of the oblique muscles explains binocular astigmatism. *Amer. Journ. Ophth.*, Sept., 1888.

464. Smith, Priestley. A tape-measure for strabismus. *Ophth. Rev.*, vol. vii., p. 349. (Method of Landolt.)

465. Stölting and Bruns. On the paralysis of the power of convergence and divergence. *v. Graefe's Arch.*, vol. xxxiv., 3, p. 92.

466. Winckler, C., en van der Weyde, A. J. Primaire myopathie gecombineerd met ophthalmoplegia progressiva superior. *Weekblad van het Nederlandsch Tijdschrift voor Geneeskunde*, Deel i., p. 69.

Collins (458*a*) observed in a man aged fifty-eight complete paralysis of the sensory branches of the fifth nerve. The cornea had completely lost its sensibility, and remained clear for eight months. The nucleus of the lens was slightly opaque.

Werner.

Jones (461) observed nystagmus in a man aged thirty-seven, who, although he was a miner, had never worked in a pit except for a few months twelve years ago. He calls attention to the peculiar manner of holding the head, and to the contraction of the orbicularis. This case of nystagmus differed materially from that generally observed among miners. Werner.

In Rockliffe's (462) patient there was paralysis of accommodation and of the abducent nerve of the right eye. Only the former disappeared after the long-continued use of mercury and iodide of potassium. Werner.

Savage (463) refers the distortion of objects when looked at through correcting cylinders to the endeavor to harmonize the meridians by the action of the oblique muscles. Neither he nor Culbertson, of whose article this is a criticism, seem to know of the prismatic action of cylinders, and of the nature of the distor-

tion which they cause when first worn, nor of the literature of the subject in *Graefe-Saemisch*, and by Wadsworth in *Trans. Amer. Ophth. Soc.*, four or five years ago. BURNETT.

STÖLTING and BRUNS (465) had under observation a lady, aged thirty, in whom, besides atrophy of the optic nerve, there was absolute paralysis of convergence, while the associated movements inward of both eyes were preserved. The pupil promptly responded to light, but only slowly to convergence. The power of accommodation was not affected. In the other case the power of divergence had been destroyed, resulting from a simple insufficiency of the external recti. In the course of four months homonymous diplopia developed, the associated lateral movements and the power of accommodation being preserved.

VIII.—ORBIT AND NEIGHBORING CAVITIES.

467. BURTON. Cutaneous affection in Graves' disease. *Brit. Med. Jour.*, Oct., 1888, p. 764.

468. GRIFFITH, HILL. Removal of orbital growth. *Brit. Med. Jour.*, Oct., 1888, p. 881. Removal of an orbital cyst.

469. HARTMANN, H. On the endothelioma of the orbit. *v. Graefe's Arch. f. Ophth.*, vol. xxxiv., 4, p. 188.

470. KRÖNLEIN, R. W. The pathology and operative treatment of dermoid cysts. *Beiträge zur klin. Chir.*, vol. iv., 1.

471. MAZZA. Étude clinique et anatomique sur un cas de tumeur orbitaire ; contribution à l'étude des cylindromes. *Rev. génér. d'ophth.*, 1888, No. 11, p. 494.

472. ROCKLIFFE. Suppurating hydatid cyst. *Trans. Ophth. Soc.*, vol. viii.

473. SILCOCK, QUERRY. Round-celled sarcoma affecting both orbits. *Trans. Ophth. Soc.*, vol. viii., p. 53.

474. SILCOCK, QUERRY. Diffuse sarcoma of frontal bone. *Ibid.*

475. SMITH, PRIESTLEY. A case of intraorbital hemorrhage and other eye complications in connection with hæmophilia. *Ophth. Hosp. Rep.*, vol. xii., 2, p. 70.

BURTON (467) describes three cases of Graves' disease complicated with affections of the skin. In the first there was pigmentation of the skin as in Addison's disease, in the second a peculiar trembling of the skin, and in the third recurrent urticaria. WERNER.

According to HARTMANN (469) the endothelioma of the orbit is a roundish, nodular, and always firm tumor. The connective tissue is generally arranged in alveoli, and these always contain the alveolar cells, either as the only contents, or mixed with small, roundish cells. It has a marked tendency to pass into a psammoma, and almost always springs from the optic nerve, either from the subvaginal space, or from the inner sheath of the nerve, which is then fully absorbed by the tumor, or it springs from the outer sheath, which then but loosely surrounds the nerve.

KRÖNLEIN (470) removed a dermoid cyst from the orbit, from the temporal fossa, after forming a semilunar flap containing skin, fascia, and temporal muscle. It consisted of two tumors connecting with each other through an opening in orbital wall. The development of this opening in the bone he attributes to a fœtal arrest of development due to the growth of the dermoid tumor. For the removal of deep-seated lateral orbital tumors he recommends temporary osteoplastic resection of the outer wall of the orbit. After a curved incision has been made along the outer orbital margin to the zygomatic bone, and penetrating to the periosteum, a wedge-shaped piece of the orbital wall is excised, the attachments of the fascias and muscles being preserved, which is returned to its former position after extirpation of the tumor.

SILCOCK (474) observed in a young woman, aged twenty, a swelling of the os frontis, which had been developing for five years. On removing a piece it proved to be an osteosarcoma.

WERNER.

IX.—CONJUNCTIVA, CORNEA, SCLERA, ANTERIOR CHAMBER.

476. FELSER, J. S. The question of micro-organisms and antisepsis of the conjunctival sac. *Wratsch*, 1888, Nos. 43 and 45.

477. GOLDZIEHER. The chronic infectious diseases of the conjunctiva. *Klin. Zeit- u. Streitfragen*, vol. ii., No. 7.

478. HAGA. Murias cocaini by conjunctivitis blennorrhoica. *Geneeskundig Tijdschrift voor Nederlandsch Indie*, Deel xxviii., p. 401.

479. JUDA. Cysticercus. *Werken van het Genootschap ter bevordering der Natuur- Genees- en Heelkunde*, Amsterdam, Deel vi., 2, p. 75.

480. KIPP, C. J. Cocaine conjunctivitis. *N. Y. Med. Rec.*, Oct. 6, 1888.

481. LEBER, TH., and WAGENMANN, A. Infantile necrosis of the conjunctiva, ending in death, with general multiple invasion of the blood-vessels with streptococci. *v. Graefe's Arch. f. Ophth.*, vol. xxxiv., 4, p. 250.

482. MULES. Lymph nævus and other lymphatic derangement of the eye and its appendages. *Report on the 9th Internat. Med. Congr.*, 1888, p. 467.

483. RANDOLPH, R. L. Congenital clouding of the cornea, affecting two sisters. *Amer. Four. Med. Sci.*, Dec., 1888.

484. RHEIN, K. The question of follicular affection of the conjunctiva. *Graefe's v. Arch. f. Ophth.*, vol. xxxiv., 3, p. 65.

485. Rynbeck. Cysticercus. *Werken van het Genootschap ter bevordering der Natuur Genees en Heelkunde*, Amsterdam, Deel vi., afl. 2, p. 80.

486. SIMI. Sublimato corrosivo nelle granulazioni della congiuntiva. *Boll. d'ocul.*, vol. x., 24, p. 168.

487. THOMSON. Acute conjuntivitis due to aniline. *Lancet*, March 14, 1888.

488. VOSSIUS, A. On amyloid degeneration of the conjunctiva. *Beiträge zur path. Anat. und allg. Path.*, vol. iv.

489. WÜRDEMANN, H. V. A peculiar tumor of the conjunctiva. *Amer. Fourn. Ophth.*, Sept., 1888.

490. WÜRDEMANN, H. V. The "tea-leaf" eye. *N. Y. Med. Rec.*, Oct. 6, 1888.

Comparative tests of the trichloride of iodine (ICl_3) and other antiseptics have convinced FELSER (476) of the superiority of the former. A solution of 1:6000 does not irritate at all, and acts much more rapidly and energetically than sublimate. Boracic acid and iodoform cannot be considered antiseptics.

HIRSCHMANN.

Besides a pathologico-anatomical review of the inflammatory diseases of the conjunctiva, GOLDZIEHER (477) presents a clinical description of trachoma, which he divides into two varieties, the blennorrhoic and the follicular; in his remarks on the differential diagnosis he strictly distinguishes between the follicular conjunctivitis and trachoma. He is decidedly opposed to excision of the retrotarsal fold according to Jacobson.

HAGA (478) found that the instillation of a 2 % solution of cocaine acts beneficially in blennorrhoic conjunctivitis. The swelling rapidly diminishes, the cornea remains uninjured, and

the whole course is shorter. Whether the action is specific, or whether the patient is more tractable on account of the anæsthesia, he does not venture to decide. WESTHOFF.

JUDA (479) removed a subconjunctival cyst from the left eye of a boy aged 11, which proved to be a cysticercus.

WESTHOFF.

KIPP (480) has had three cases of follicular conjunctivitis, which he thinks clearly attributable to the use of cocaine. All the patients were over seventy years of age, and the use of the drug had been continued from two to six months. BURNETT.

LEBER and WAGENMANN (481) report that they found numerous streptococcus-colonies in various blood-vessels of the body of a child which had suffered from necrosis of the conjunctiva. Not only the blood-vessels of the conjunctiva and the episcleral tissue contained streptococcus-colonies, but also the blood-vessels of the interior of the eye, the optic nerve and its sheaths, and various distant parts of the body. They also found in the necrotic parts of the conjunctiva a dense, diffuse infiltration of the tissue with the same streptococci. The latter were undoubtedly the cause of the trouble. The microbes were carried thence through the blood-vessels to the other parts of the body, and finally caused death.

RANDOLPH (483) reports the cases of two girls, aged respectively four and twelve years, in which there was a congenital bluish haze of both corneæ. The opacity embraced the epithelial layer and the outer part of the corneal tissue proper. Teeth unsound, but not typically Hutchinson's. The author regards the condition as the result of inflammation in utero, and most probably as specific. BURNETT.

According to RHEIN (484) the pathological formation of follicles in the conjunctiva is due to micro-organisms which penetrate into the tissue, and at first do not destroy it, but by their growth cause an inflammatory reaction, which leads to the development of follicles. The follicles formed in tuberculosis of the conjunctiva do not differ in any way, either micro- or macro-scopically, from those of trachoma. The difference in the stage of follicular development can only be shown either by the demonstration of the micro-organisms, or by experiments upon animals. Trachoma is probably not due to any particular species of coccus, but to a variety of them. It is a collective disease, which includes all those affections of the conjunctiva, with the exception of tubercu-

lar conjunctivitis, in which the development of follicles takes place in the adenoid tissue.

RYNBECK (485) observed a subconjunctival cysticercus, which broke without assistance and healed. WESTHOFF.

According to Simi (486) it is uncertain whether corrosive sublimate acts in trachoma only by killing the microbes, as stronger solutions cause the formation of an albuminate in consequence of the caustic action, which prevents further action of the solution and protects the microbes deeper in the tissue. For washing the eye it may be replaced by distilled water or solutions of boracic acid; as a caustic, nitrate of silver; as an astringent, by tannin; as a specific by hydrarg. biniod. rubr. DANTONE.

THOMSON (487) reports the case of a lady, into whose conjunctiva the tip of an aniline pencil had penetrated, causing discoloration and severe conjunctivitis. WERNER.

VOSSIUS (488) examined two cases of amyloid degeneration of the conjunctiva. The tumors had developed in otherwise healthy persons and upon a conjunctiva which showed no signs of trachoma. Only one eye was affected. The degeneration was combined with hyperplasia of the papillary body. The papillæ had become enlarged partly in consequence of the proliferation of the tissue, partly as the result of the amyloid products. They were either the results of simple retrogressive metamorphosis of the tissue, or a chronic inflammatory process had caused the amyloid degeneration. The latter was always formed at once, without the development of hyaline as an intermediate stage.

In WÜRDEMANN'S (489) case the growth was on the conjunctiva of the upper lid, and extended 4 *mm* back from the edge and projected externally for nearly 2 *mm*. The hairy growth had the appearance of a feather and was nearly ¾ in. long. Microscopically it had the appearance of fœtal wool. BURNETT.

WÜRDEMANN (490) gives a very good drawing of the condition of an eye that has been subjected for a long time to a poultice of tea-leaves, a form of popular therapeutics particularly common among the negroes. It is a form of muco-purulent conjunctivitis with swelling and softening of the lids, which may go on even to ulceration of the cornea if the course is continued. BURNETT.

491. BICKERTON. Unusual corneal opacity in process of recovery. *Ophth. Rev.*, vol. vii., p. 274.

492. CROSS. Tumor of the cornea. *Trans. Ophth. Soc. Unit. Kingd.*, vol. viii., p. 62.

493. DINKLER. Two cases of perforating ulcer of the cornea after conjunctival gonorrhœa. *v. Graefe's Arch. f. O.*, vol. xxxiv., 3, p. 21.

494. GORECKI. Treatment of buphthalmus by iridectomy. *Soc. d'ophth. de Paris*, Oct., 1888.

495. HIGGINS. Conical cornea treated by cauterization. *Trans. Ophth. Soc. Unit. Kingd.*, vol. viii., p. 289.

496. MEYER, E., and BERGER, E. Lepra-tumor of the cornea of a sarcomatous nature. *v. Graefe's Arch. f. Ophth.*, vol. xxxiv., 4, p. 219.

497. THOMPSON, J. T. A note on the operation for staphyloma of the cornea. *Trans. Oph. Soc.*, vol. viii., p. 287.

498. WILLIAMS. Three cases of conical cornea treated by the actual cautery. *Ophth. Rev.*, vol. vii., p. 302.

499. WILLIAMS. Traumatic keratalgia. *St. Louis Med. and Surg. Journ.*, vol. lv., No. 5.

BICKERTON'S (491) patient had a yellowish opacity of the cornea, which occupied about one fourth of it, and gradually cleared up. It was probably due to deposits of urates and phosphates, or to the presence of fat. WERNER.

DINKLER (493) examined two eyes which had been destroyed by perforating corneal ulcers following gonorrhoic conjunctivitis. He found that the gonococci had developed in the pavement epithelium of the cornea and iris, which conflicts with the statement of Bumm, according to whom these cocci develop only in cylinder epithelium.

GORECKI (494) presented at a meeting of the Soc. d' ophth. de Paris, a child aged 3 years, which he had operated on at the age of 10 months and again at the age of 14 months on account of buphthalmus with good result. MARCKWORT.

HIGGINS (495) and WILLIAMS (498) have treated cases of keratoconus with the galvano-cautery with good result. WERNER.

In MEYER and BERGER'S (496) patient a tumor was removed from the cornea which at first was thought to be a sarcoma. It proved, however, to be a lepra-nodule, the disease manifesting itself first in the eye.

THOMPSON (497) operates for staphyloma of the cornea by ligating the base with a horse-hair. WERNER.

500. CROSS, F. R. Sclera containing silver artificial vitreous. *Trans. Oph. Soc. Unit. Kingd.*, vol. viii., p. 290.

501. WILLIAMS, A. D. Hemorrhages into the anterior chamber from rupture of the canal of Schlemm. *St. Louis Med. and Surg. Journ.*, vol. lv., No. 6.

CROSS (500) found that in an eye, which had contained an artificial vitreous for some time, the sclera was thinned, very vascular, and adherent to the conjunctiva. The recti muscles were atrophic and had shortened. WERNER.

Sections X.–XIX. Reviewed by DR. NIEDEN.

X.—IRIS.

502. COLLINS, W. J. The capsulo-pupillary membrane, with some varieties of its persistence. *Royal London Ophth. Hosp. Rep.*, vol. xii., p. 2, p. 195.

503. FRIEDENWALD, H. (Hirschberg's ophthalmic clinic). A case of iris-cyst after magnet-extraction. Cure by excision, with good visual result. *Centralb. f. Augenhk.*, vol. xii., p. 341.

504. NETTLESHIP, E. On iridectomy for recurrent iritis. *Trans. Oph. Soc. Unit. Kingd.*, vol. viii., p. 94.

505. STEPHENSON. Persistent pupillary membrane (illustrated). *Illustr. Med. News*, No. 3, p. 50.

COLLINS (502) reports on six cases of persistent capsulo-pupillary membrane, in which the fibres passed from the ridges of the iris to the anterior surface of the lens, thereby distinguishing themselves from the pupillary fibres which simply pass over the pupil. The illustrations show capsulo-pupillary membranes with and without opacities of the capsule, and pupillary membranes in form of tangential fibres, simple stripes, and extensive plaques. WERNER.

503. FRIEDENWALD reports a case of iris-cyst, which developed ten weeks after a chip of steel had been extracted with the magnet through a wound at the inner lower scleral margin, into which the iris seemed drawn. The wall of the cyst was excised simultaneously with the iridectomy, and a cure effected. The rapid development of the cyst is worthy of note. The implantation of corneal or conjunctival epithelium was probably the cause of the development of the cyst.

NETTLESHIP (504) reports on twenty cases of recurrent iritis, in some of which he performed iridectomy. He believes that the clinical peculiarities of iritis are due more to constitutional than

to local causes. In regard to iridectomy, the prognosis was more unfavorable in cases of keratitis punctata, chronic thickening of the iris, with extensive posterior synechiæ and myopia. The same is true in cases of inclination to spontaneous hemorrhage and formation of hypopyon. The cases most suitable for an operation are (1) cases of acute recurrent iritis without marked changes in the aqueous humor and without extensive structural changes in the iris, except the adhesions; (2) cases of chronic iritis, with circular (not total) synechiæ and bulging of the iris. WERNER.

XI.—CHOROID.

506. AYRES, S. C. Syphilitic gummata of the ciliary body. *Amer. Jour. Ophth.*, Aug., 1888.

507. COLLINS, E. T. Colloid disease of choroid? *Trans. Oph. Soc. Unit. Kingd.*, vol. viii., p. 177.

508. MCHARDY. Localized tuberculosis of the choroid; enucleation and recovery. *Trans. Ophth. Soc. Unit. Kingd.*, vol. viii., p. 179.

509. MULES, P. H. Tumors of the ciliary body. *Ibid.*, p. 66.

510. SCHIESS-GEMUSEUS. Cavernous angioma of the choroid. *v. Graefe's Arch. f. Ophth.*, vol. xxxiv., 3, p. 240.

511. SCHIESS-GEMUSEUS. Callous formation on the ciliary body, simulating a tumor. *Loc. eod.*, p. 247.

512. SNELL, SIMEON. Sarcoma occurring in an eye operated on by sclerotomy for glaucoma. *Trans. Oph. Soc. Unit. Kingd.*, vol. viii., p. 87.

AYRES (506) gives the clinical history of five typical cases of gumma of the ciliary body. Microscopic examination by Dr. Peter Harper showed that the mass was composed of a caseous centre, made up of shrunken cells, broken-down granules, and some fibrous bands, extending to a capsule enclosing the whole
BURNETT.

COLLINS' (507) case was that of a woman aged seventy-four, whose sight had been reduced to counting figures. There were some striæ in the lens, while the fundus, with the exception of the macula lutea, was studded with numerous round or oval grayish dots, perhaps of a colloid nature. WERNER.

MCHARDY'S (508) patient was a child six years old, which was recovering from a local tuberculous (?) peritonitis. No heredity

in this direction. The urine was free from albumen, but in the lower part of the left eye spots were visible which resembled those seen in the fatty degeneration in albuminuric retinitis. Within four weeks these spots had become confluent, forming a whitish mass, the surface of which was best seen with + 12D. It lay behind the retinal blood-vessels. The eye was enucleated, and examined under the microscope, which revealed the purely tubercular structure of the tumor, though the presence of bacilli could not be demonstrated. WERNER.

MULES (509) observed two cases of tumor of the ciliary body, one of which developed in a boy aged twelve after an injury, while the other occurred in a woman aged thirty-eight. In the latter it was of a yellowish-brown color, and situated at the inner side of the sclero-corneal margin, being visible on account of irido-dialysis. Mules then discusses the diagnosis of ciliary tumors, and calls attention to the danger of a trial-puncture for making the diagnosis. He adds the statistics of twenty-seven cases, seventeen of whom were women and nine men; of one the sex is not mentioned. In twelve cases there was irido-dialysis. The majority were spindle-celled sarcomas. Five illustrations are added. WERNER.

SCHIESS (510) enucleated the left amaurotic eye of a girl aged 14 on account of glaucomatous symptoms, and found under the retina a flat thickening upon the choroid ½ *mm* thick, which extended along the equator and included about one third of the periphery of the globe. It proved to be a flat cavernous angioma circumscriptum. It probably had a direct connection with the increased tension.

SCHIESS (511) saw a peculiar yellowish-green reflex emanate from the most anterior lateral parts of the vitreous of the left, highly amblyopic eye of a woman aged 42. As the lateral part of the iris also bulged and T was increased, the diagnosis of a tumor of the anterior parts of the choroid was made and the eye enucleated. On opening the eye, however, a bright, yellowish mass of connective tissue was found upon the posterior surface of the ciliary body, occupying about one third of the circumference of the eyeball. It was made up of fine fibres, and although there was no history of an injury, the hyperplasia was found to be connected with a string of connective tissue penetrating into the vitreous, evidently the result of a stab wound.

SNELL'S (512) case was that of a man aged 42, in whom, three years after sclerotomy a sarcomatous tumor was observed at both

ends of the incision. After the enucleation it was found that the whole interior was filled with the tumor, which was connected with the two outer ones through a perforation of the sclera. Although a relapse was removed from the orbit six months later, no further traces have appeared to date (Aug. 1888). Whether the tumor developed before or after sclerotomy can no longer be determined. (A number of such cases are on record. There is no evidence in any one of them of the preëxistence of glaucoma. —H. K.) WERNER.

XII.—GLAUCOMA.

513. EMRYS-JONES. Persistent hemorrhage into the anterior chamber after iridectomy for chronic glaucoma. *Trans. Ophth. Soc. Unit. Kingd.*, vol. viii., p. 285.

514. GALEZOWSKI. Quelques mots sur le glaucome. *Rec. d'ophth.*, 1888, No. 11, p. 587.

515. LOGETSCHNIKOW. Three cases of glaucoma in aphakial eyes. *Wjestnik Ophth.*, July-Oct., 1888.

516. NETTLESHIP, E. On the prognosis in chronic glaucoma. (Three clinical lectures delivered at the hospital in June, 1888.) *Royal London Ophth. Hosp. Rep.*, vol. xii., p. 2, p. 72.

EMRYS-JONES (513) saw after an iridectomy for chronic glaucoma a hemorrhage into the anterior chamber which only disappeared two months after the operation. WERNER.

GALEZOWSKI (514) explains and recommends posterior sclerotomy in the same manner in which he did this at the Heidelberg Ophthalm. Internat. Congress in 1888. MARCKWORT.

LOGETSCHNIKOW (515) reports on three cases of glaucoma in aphakia. In the first case acute glaucoma developed 7 months, in the second 3 months, after a successful flap extraction with iridectomy; in the third, chronic glaucoma 10 years after a perfect peripheric extraction with broad iridectomy. HIRSCHMANN.

NETTLESHIP (516) in discussing chronic glaucoma touches upon the period of time during which it may exist, and mentions a case of 22 years' standing. He also mentions cases of heredity, others in which changes at the disc preceded the other symptoms, and some in which the disease came to a standstill without ending in blindness. Eserine may check its progress for a while, but rarely accomplishes a cure. He also reports on the various kinds of glaucoma, and on 20 operative results, the benefit of which he could verify after not less than two years. Among the various

conditions which influence the result the reaction of the pupil seems to be the best guide, as in nearly all successful cases it promptly responded to eserine. The general state of health as well as the age seem to have an important bearing on the result. Most of the patients in whom good results were obtained were 40 years of age or younger. Nettleship thinks that an operation should be done as early as possible in cases of chronic progressive glaucoma. He asserts that he has never observed a continued contraction of the visual field after the operation, when it was already much contracted before. After a thorough test of the merits of sclerotomy he announces himself as in favor of iridectomy in chronic glaucoma, and performs the former operation only when the latter has proved a failure. WERNER.

XIII.—SYMPATHETIC OPHTHALMIA.

517. VAN DEN BERGH. Ophthalmie sympathique après excision d'une staphylome. *Ann. d'ocul.*, vol. c., p. 115.

518. MAZZA, ANDREA (Geneva). On experimental sympathetic ophthalmia. *Report of the 7th Internat. Ophth. Congr. at Heidelberg*, 1888. p. 416. J. F. Bergmann, Wiesbaden.

519. SIRE. De l'amputation du segment antérieur de l'œil comme traitement de l'ophthalmie sympathique. *Thèse Montpellier*, 1888.

VAN DEN BERGH (517) excised in a boy, aged five, a total staphyloma of the cornea and iris of the right eye, due to diphtheria. Antisepsis with sublimate. The instruments were dipped into a 3 % solution of boric acid. After the conjunctiva had been sufficiently detached and provided with sutures, the staphyloma was split, and both segments were cut off at the base, when the lens was found to be absent. The sutures were then tied over the wound. Healing smooth, but the stump remained soft, injected, and sensitive to pressure. A few days later sympathetic irritation of the other eye was observed, and two months after the operation van den Bergh found sympathetic ophthalmia in form of plastic iritis and sensitiveness to pressure. Although he had advised an early enucleation of the operated eye, the parents did not consent until it was too late, so that also the left eye became completely atrophic. At the end of his paper the author says: "I shall still occasionally operate on corneal staphylomas, but I shall be suspicious in eyes which have been destroyed by diphtheria."

MARCKWORT,

MAZZA (518) in repeated experiments could not demonstrate a transmigration of staphylococci from the injected eye to the other, nor could he discover any changes with the ophthalmoscope or other means, even after a longer period of time. Where micrococci had penetrated into the optic nerve, or its sheath, death followed from meningitis. If they advanced towards the chiasm, he saw them take their course through the blood-vessels of the optic nerve, as Gifford did, and never through the sheaths. Mazza, therefore, comes to the conclusion that no sympathetic ophthalmia can be produced experimentally with staphylococcus pyogenes.

XIV.—LENS.

520. ARCOLEO. L'estrazione della capsula anteriore del cristallino nella operazione della cataratta. *Ann. di ottalm.* vol., xvii., 4, p. 329.

521. BROCKMANN, DRAKE (Madras). A statistical review of 1,626 cases of cataract. *Ophth. Rev.*, vol. vii., p. 317.

522. CAUDRON. Études sur les traumatismes du cristallin. *Rev. génér. d'ophth.*, Dec., 31, 1888, p. 533.

523. CHISOLM, J. J. Cataract-extractions with only the eye operated on closed by adhesive strips. *Journ. Amer. Med. Assoc.*, Nov. 3, 1888.

524. DISCUSSION ON THE TREATMENT OF SENILE CATARACT. *Brit. Med. Jour.*, Nov., 1888, p. 1156. (Brit. Med. Assoc. 56th Annual Meeting at Glasgow, Aug., 1888.)

525. FROTHINGHAM, G. E. Some observations concerning the extraction of cataract without an iridectomy, and the use of the bandage in the after-treatment. *Journ. Amer. Med. Assoc.*, Oct. 13, 1888.

526. GILLET DE GRANDMONT. Des inconvénients de la liqueur de Van Swieten injectée dans la chambre antérieure. *Soc. d'ophth. de Paris*, Oct. 2, 1888.

527. GRAEFE, A. A word in favor of iridectomy in the extraction of hard cataracts. *v. Graefe's Arch. f. Ophth.*, vol. xxxiv., 3, p. 223.

528. GUNN. Growth of new lens-fibres after spontaneous absorption of traumatic cataract. *Trans. Ophth. Soc. Unit. Kingd.*, vol. viii., p. 126.

529. HIRSCHBERG, J. Formation of drops in beginning cataract. *Centralbl. f. Augenhk.*, vol. xii., p. 361.

530. LAWFORD, J. B. On the pathological anatomy of lamellar or zonular cataract. *Royal London Ophth. Hosp. Rep.*, vol. xii., part ii., p. 184.

531. NORSA. Un caso di lussatione della lente cristallina nella camera anteriore ; riduzione. *Boll. de Soc. Loncisisiana*, May, 1888.

532. PROUDFOOT, A. Excessive intraocular hemorrhage after cataract-extraction, followed by enucleation. *Amer. Journ. Ophth.*, Oct., 1888.

533. SIMI. Emorragia intraoculare dopo l'estrazione della cataratta. *Boll. d'ocul.*, vol. x., 2–3, p. 153.

534. SUAREZ DE MENDOZA. De la suture de la cornée dans l'extraction de la cataracte. *Soc. d'ophth. de Paris*, December 4, 1888.

ARCOLEO (520) describes the various methods which have been proposed since the days of Daviel for the removal of the lens-capsule, and believes that this can be accomplished in the best and surest manner with the toothed forceps-cystotome lately devised by de Wecker. DANTONE.

DRAKE BROCKMANN (521) performed this second series of operations in Madras during a period of two years and eight months. These statistics lose some of their value owing to two causes : first, the imperfect and early testing of vision, as most of the patients were natives ; and secondly, the inclusion of all varieties of cataract, senile, congenital, and traumatic. In 1,433 cases of "primary capsule-rupture" (*i. e.*, division of the capsule before the corneal section 1,165 extractions were performed without iridectomy. There were 80 failures, = 5.59 %, which included suppurative keratitis in 45, iritis in 26, irido-choroiditis in 3, and suppuration of the eyeball in 6. As regards accidents, prolapse of iris occurred in 90 cases, and vitreous was lost in 60. Snellen's test-dots were read at 6 *m* in 109 cases, and in only 3 of them an iridectomy had been performed. Although the best results were obtained without iridectomy, it was in these cases that the greatest number of secondary operations were required. There were 10 patients with elephantiasis, 1 with leprosy, and others suffering from various general diseases, but nearly all did well.

WERNER.

CAUDRON (522) reports a case of partial traumatic opacity of the lens, which disappeared after a few days ; the capsule was not injured. The injury was caused by the corner of a horse-blanket,

while being shaken, striking the eye. Caudron discusses the literature at length. MARCKWORT.

CHISOLM (523) has lately been treating his cataract-extractions in the freest manner possible—not confining the patient to bed, and simply closing the lids of the eye operated upon with strips of isinglass-plaster. He claims that his results under this after-treatment are as good as when he bandaged both eyes and confined the patient to bed in a dark room. BURNETT.

Iridectomy in cataract-extraction was the principal topic in the DISCUSSION ON THE TREATMENT OF SENILE CATARACT (524). Grossman, Hewetson, Snell, Power, Teale, and McHardy were among those who operated without iridectomy, while Carter, Meighan, Lloyd-Owen, Lee, and Wolfe still adhered to excision of the iris. Carter and McHardy spoke favorably of preliminary iridectomy in immature cataract. Lee performed irrigation of the anterior chamber in 21 cases, 6 immature, without any escape of vitreous and without iritis. Hewetson used salufer-wool (silico-fluoride of sodium) and left the eye undisturbed for a week. Prolapse of iris was, in his experience, very rare. Wolfe has never yet used cocaine. (!) WERNER.

As a result of an experience of over 700 extractions, more than 200 being flap-operations, FROTHINGHAM (525) concludes that the Graefe knife is the best for making the incision, that the incision should not lie farther forward than the sclero-corneal junction at the apex, and that a large iridectomy should be made. He is not favorably inclined to extraction without iridectomy, and believes in bandaging the eye for several days after the operation. BURNETT.

GILLET DE GRANDMONT (526) reports on two cases of cataract-extraction, which clearly demonstrate the injuriousness of injections of sublimate into the anterior chamber. The cornea becomes gray and opaque, and does not become clear again until after the lapse of ten days. Parent, Valude, Abadie, Galezowski, Meyer, Gorecki, and Chevallereau express themselves similarly. Some even observed permanent opacity of the cornea, iritis, and anterior and posterior synechiæ (*cf.* Heidelberg Cong., 1887, Laqueur). MARCKWORT.

GRAEFE (527) is in favor of the retention of iridectomy in cataract-extraction, and claims for v. Graefe's method, for the present and for all time,—not only the retention of the knife, but also the iridectomy as the most essential part of the whole operative procedure.

GUNN (528) gives an illustration of a case in which, after absorption of traumatic cataract, new lens-fibres were formed from the cells at the periphery where the anterior epithelium leaves the capsule. This was corroborated by microscopic examination. WERNER.

HIRSCHBERG (529) calls attention to the formation of drops, which appear either singly or in groups behind the anterior capsule of the lens, and may frequently be observed with the aid of a lens in incipient cataracts of old diabetics; also in healthy people and in cases of retinal cataract.

LAWFORD (530) describes the microscopic appearances in three cases of zonular cataract. The changes were in the main the same as those observed by Beselin. The nuclear area enclosed by the zone of degeneration contained a number of small, irregular dots, which the author has not seen in other lenses similarly hardened, though Beselin has noticed them in lenses with senile cataract, when preserved in alcohol. WERNER.

NORSA (531) describes a case of spontaneous dislocation of a clear lens into the anterior chamber. After repeated repositions under mydriasis the lens apparently became fixed in the anterior lower part of the vitreous, without causing any further disturbances. DANTONE.

In PROUDFOOT'S (532) case the operation was performed without an iridectomy, and yet the eye immediately filled with blood. It was finally enucleated and the origin of the hemorrhage definitely located in the retina. BURNETT.

SIMI (533) reports on two cases of choroidal hemorrhage after cataract-extraction, in which the whole contents of the globe were driven through the wound. DANTONE.

SUAREZ DE MENDOZA (534) inserted a corneal suture after a cataract-extraction in an eye with ectropium. Two sutures were applied in a peculiar manner, which he will describe later. The sutures were removed on the fifth day; the infiltration of the cornea which they caused was slight. He thinks that this method might be more generally adopted, but that in such cases at least it is directly indicated. He claims that the wound heals more readily. Subsequent incarceration of the iris and hernias are avoided. The eye need not be bandaged. The patient may get up on the second day. The reopening of the wound on the second or third day is made impossible. Parent thinks that the method may be the more readily introduced in France, as the

majority of French oculists now operate without iridectomy, which has the great disadvantage of more frequent incarceration of the iris and of hernias. Parent suggests the introduction of the threads immediately after the corneal section, to draw from the wound a loop which hangs down on both sides, and then perform cystotomy and extraction before tying the knots.

MARCKWORT.

XV.—VITREOUS.

535. BENSON, A. H. Hyalitis punctata. *Ophth. Rev.*, vol. vii., p. 304.

BENSON (535) designates by this term an appearance exactly similar to keratitis punctata, but occurring on the anterior portion of the hyaloid membrane. The disease occurred in a woman æt. 32, free from syphilis; she had very slight iritis with keratitis punctata, and on the posterior capsule of the lens (visible with + 26 D) were a number of spots exactly similar in arrangement to the keratitis punctata. These spots are not to be mistaken for "dust-like" opacities. WERNER.

XVI.—RETINA AND FUNCTIONAL DISTURBANCES.

536. ANDERSON, J. Subretinal effusion in chronic nephritis. *Trans. Ophth. Soc. Unit. Kingd.*, vol. viii., p. 141.

537. BAVEVI. Contributo allo studio dei tumori endoculari nei bambini. Nota clinica e istologica. *Ann. di ottalm.*, vol. xvii., 4, p. 305.

538. BERKOWITSCH. The etiology of the epidemic amaurosis gallina in the army. *Russkaya Med.*, 1888, No. 43.

539. CASTALDI. Considerazioni cliniche sulla patogenesi e cura dello scolamento della retina. Napoli, A. Belisario e C. 1888.

540. CERESETO. Scolamento retinico. Nuovo processo operatorio proposti dal Abadie. *Gazz. Med. di Torino*, vol. xxxix., 18, p. 409.

541. DOYNE, R. Retinal hemorrhage. *Trans. Ophth. Soc. Unit. Kingd.*, vol. viii., p. 162.

542. HOSWELL. A case of hereditary amblyopia. *Brit. Med. Jour.*, Dec., 1888, p. 1,279.

543. HIRSCHBERG, J. On specific retinitis. *Berliner klin. Wochenschr.*, No. 46, 1888, and *Centralbl. f. Augenhk.*, vol. xii., p. 369.

544. LANG, W. On hemorrhages in the macular regions. *Trans. Ohpth. Soc. Unit. Kingd.*, vol. viii., p. 155.

545. MACKAY, GEO. A contribution to the study of hemianopsia of cerebral origin, with special reference to acquired color-blindness. *Brit. Med. Journ.*, Nov. 10, 1888, p. 1033.

546. MELLINGER, C. Unusually large hemorrhage in the region of the macula lutea. Complete absorption, and restoration of perfect vision. (Colored plate.) *Zeh. klin. Monatsbl.*, vol. xxiv., p. 404.

547. VAN MILLINGEN. Toxic amblyopia. *Trans. Ophth. Soc. Unit. Kingd.*, vol. viii., p. 240.

548. MILES, MILEY. Neuro-retinitis in Bright's disease. *Trans. Ophth. Soc. Unit. Kingd.*, vol. viii., p. 132.

549. MULES, P. A. On embolism of a branch of the central retinal artery treated with massage, with restoration of the visual field. *Trans. Ophth. Soc. Unit. Kingd.*, vol. viii., p. 151.

550. NETTLESHIP, E. A case of stationary night-blindness, with minute white spots at the fundus. *Trans. Ophth. Soc.*, vol. viii., p. 163.

551. NETTLESHIP, E. Hemorrhagic retinitis in a patient with diabetes ; varicose swellings on a retinal vein in the right eye. *Trans. Ophth. Soc.*, vol. viii., p. 161.

552. NETTLESHIP, E. Chronic retinitis with formation of blood-vessels in the vitreous in a patient with diabetes. *Trans. Ophth. Soc.*, vol. viii., p. 159.

553. OSTWALT, F. On syphilitic retinitis : its ophthalmoscopic picture, its pathologico-anatomical basis and its semiotic importance. (With illustrations.) *Trans. 7th Internat. Ophth. Congr. at Heidelberg*, 1888, p. 474 ; J. F. Bergmann, and *Berliner klin. Wochenschr.*, 1888, No. 45.

554. SCHÔBL, J. A few words on specific and tubercular choroiditis. *Centralbl. f. Augenhk.*, vol. xii., p. 321.

ANDERSON (536) relates a case of detachment of the retina and neuro-retinitis in both eyes of a girl æt. 9, who subsequently died from interstitial nephritis, as proved by post-mortem examination.

WERNER.

BAVEVI (537) examined three eyeballs of children which had been enucleated on account of intraocular tumors. Two of the growths proved to be true glio-sarcomas, which had taken their origin in the nerve-fibre layer of the retina near the ciliary body.

The third neoplasm was a melanotic sarcoma of the choroid. Its origin could not be determined on account of the great extent of the tumor. DANTONE.

BERKOWITSCH (538) observed during the great fast an epidemic of amaurosis gallina in a Cossack regiment, which attacked one third of all the men; it was traceable to improper food, and disappeared as soon as better nourishment was provided.
HIRSCHMANN.

CASTALDI (539) asserts that an almost certain cure can be effected with iridectomy in cases of detachment of the retina following irido-cyclitis, or irido-choroiditis with marked glaucomatous symptoms, but that the result is doubtful when the detachment is not dependent upon inflammation of the anterior uveal tractus. He claims that of five eyes thus operated upon three entirely recovered, while one was much improved. DANTONE.

DOYNE'S (541) patient, a gentleman aged 40, who suffered from cirrhosis of the liver and anæmia, suddenly lost his sight, with retention only of perception of light; the latter appeared red. The cause was found to have been a semicircular hemorrhage at the fovea, the oval reflex of which persisted in front of it. There was a positive scotoma. In 7 months $V = \frac{6}{6}$. WERNER.

HOSWELL (542) gives a genealogical table of four generations including twelve cases of amblyopia, four of which were examined ophthalmoscopically and were found to have atrophy of the optic nerve. All the males were smokers, but the affection occurred in two females and in a boy aged 9. One patient became blind at 40 years of age. In two generations the disease affected only the males. WERNER.

HIRSCHBERG (543) gives a detailed review of the symptomatology of specific retinitis, based on about 300 cases. The first symptoms may appear from four to six months after the infection. Almost all the patients complain of persistent dazzling, probably due to the diminution of the supply of arterial blood in consequence of affection of retinal arteries. This is attended with a kind of hemeralopia with marked diminution of the light-sense. Scotomas follow and blindness may be the result, though an energetic antisyphilitic treatment generally effects a rapid cure. The disease is really a chorio-retinitis, although almost all parts of the eye undergo changes; cornea, iris, lens, and vitreous. The dust-like opacity of the vitreous is scarcely ever absent. Small white spots appear at an early stage at the centre and

periphery of the retina, arranged like berries around the blood-vessels, free from pigment and sharply outlined, without any tendency to unite. The central opacity of the retina is also characteristic. Relapses are of frequent occurrence and depend mainly upon the changes in the blood-vessels. Complications with cerebral affections of the same origin are not rare.

LANG (544) records the case of a healthy lad æt. 20, subject to constipation, who noticed that his sight suddenly got blurred and that he saw a red blur before objects after an action of the bowels. There was a circular hemorrhage three times the diameter of the disc at the macula; to it corresponded a central scotoma. Four months later V = $\frac{6}{6}$, and the hemorrhage had disappeared. The author believes that the hemorrhage was situated between the membrana limitans interna and the hyaloid. Gunn has shown that the hyaloid is not adherent to the retina at the macula, but is attached to it around, thus accounting for the circular shape. When a light appears red the hemorrhage is probably in front of the retina and vision is more likely to be restored. WERNER.

MACKAY (545) points out the necessity of examining the condition of the light-, form- and color-senses in the peripheral parts of the field as well as in the centre. Cases of relative hemianopsia, where the three senses are not all lost, are not, he says, examined with sufficient care. There are two varieties of relative heminanopsia: (1) where the color-sense alone is lost, and (2) where color- and form-sensations are lost, leaving the light-sense intact. The author made a tabular analysis of all published cases of "hemichromatopsia," and doubts whether any of them have been examined with sufficient completeness to exclude slight defect of form- and light-sense; in an observation of his own which was at first looked upon as a case of pure color-defect, more delicate test-objects revealed a diminution of the form-sense. He admittted the difficulty of a peripheral examination of the light-sense, and showed the importance of inquiring into the patient's power of distinguishing white and black peripherally before employing test-objects for the form-sense. The theory of a special centre for color is not supported by the facts, although they do not justify a direct negation. WERNER.

MELLINGER (546) reports a case of large retinal hemorrhage about four times the size of the papilla, which he observed in the region of the macula of a cachectic-looking man aged 35; it had

occurred spontaneously in the left eye, and was surrounded with numerous small hemorrhages in the retina. The urine was free from albumen and sugar. Complete restoration of vision took place in four months after the application of the ice-bag, but from the spot where the hemorrhage had been a delicate, white shining strand extended into the vitreous.

VAN MILLINGEN (547) records eight cases of toxic amblyopia in foreigners (not Turks), four of whom were non-smokers. Although all Turks smoke, he has never seen a case of central scotoma from smoking among them. They smoke cigarettes, the tobacco of which contains 3 to 4 % of nicotine, and inhale the fumes into the lungs. The author believes that tobacco-poisoning occurs not from the smoke but from the nicotine in solution which is swallowed. WERNER.

MILES (548) gives statistics of renal cases, with reference to the prognosis in albuminuric retinitis, and draws the following conclusions: retinal changes occur late in renal diseases; the mortality amongst those affected with ocular disease is double that of the non-affected cases; the average duration of life, after the first note of eye-changes was made, was four months. WERNER.

MULES' (549) patient was a woman aged twenty-one. The lower retinal artery was plugged up to its division and there was contraction of the field above. Massage an hour after the occurrence caused the artery to fill, and the vision was found to become normal, but the field still contracted; later on this also became normal in extent but a small scotoma remained just above the point of fixation, indicating that the nerve-fibre layer was intact and that the destruction was confined to the rods and cones.

WERNER.

NETTLESHIP (550) records the case of a man æt. 21 who suffered from night-blindness from birth. The parents were second cousins. One of his sisters had a similar defect of sight. The fields were somewhat contracted in daylight, but very much more by dim gaslight. The central part of the fundus was covered with minute scattered non-pigmented white dots. Discs slightly hazy, but no retinitis pigmentosa. The white dots were not the same as those described by Masselon in the paper on "infiltration vitreuse de la retine," which is a disease of advanced life, often causing no defect of sight and never giving rise to night-blindness or contraction of the visual field. The author thinks that some of the cases of "retinitis punctata albescens" described by

Mooren correspond with the above case, as also cases of Gayet (*Arch. d'ophth.*, vol. iii., p. 386, 1883), and Dor (*ibid.*, p. 481).

WERNER.

NETTLESHIP'S (552) observation of chronic retinitis with formation of new blood-vessels in the vitreous was that of a diabetic who had lost one eye from chronic iritis. There were also large new-formed blood-vessels in the iris. WERNER.

On a basis of eight clinical cases OSTWALT (553) describes the symptoms of syphilitic retinitis, which generally assumes the form of central retinitis and is characterized by small, grayish-white clusters, which are principally observed along the terminal ramifications of the arteries, but are also found at the periphery. They are so delicate that they can be seen only in the upright image under weak illumination. There may also be a haziness in the region of the macula, while delicate opacities in the vitreous are rarely found. A small negative central scotoma can almost always be demonstrated, sometimes also a positive scotoma. V is often very good, generally, however, somewhat diminished. A rapid cure is usually obtained with inunction. In most cases small choroidal patches are also found at the periphery. These appearances are due to changes in the adventitia and intima of the small arteries, the same as we find in acquired and congenital syphilis; they are identical with the changes found by Hübner, and are therefore of great prognostic importance.

XVII.—OPTIC NERVE.

554*a*. CARTER, BRUDENELL. Operation of opening the sheath of the optic nerve for the relief of pressure. *Ophth. Rev.*, vol. viii., p. 304.

555. CASTALDI. L'atrofia grigia della papilla del nervo ottico e la sclerosi della midolla spinale e del cervello. Napoli, Subrano, 1888.

556. HABERSHON. Hereditary optic atrophy. *Trans. Ophth. Soc.*, vol. viii., p. 190.

557. MACKENZIE, STEPHEN. Ophthalmic cases. *Illustr. Med. News*, 1888, No. 3, p. 49.

558. PICQUÉ, LUCIEN. Étude critique sur l'anatomie pathologique et la pathogénie des névrites optiques. *Arch. d'ophth.*, vol. vii., No. 6, Nov., 1888, p. 486 (continuation).

559. SCHIESS-GEMUSEUS. Total myxo-sarcoma of the optic nerve removed with preservation of the globe. *v. Graefe's Arch. f. Ophth.*, vol. xxxiv., 3, p. 226.

560. DE SCHWEINITZ, G. E. Acute unilateral optic neuritis, with the report of a case. *Journ. Amer. Med. Assoc.*, Dec. 15, 1889.

561. STEPHENSON, S. Neuritis after measles. *Trans. Ophth. Soc.*, vol. viii., p. 250.

CARTER (554*a*.) reports on three more cases in which he opened the sheath of the optic nerve in order to reduce the pressure. In the first V rose from $\frac{2}{60}$ to $\frac{2}{40}$. In the second, one eye regained perception of light, while the other "slowly improved." In the latter V rise from o to $\frac{1}{10}$. The author considers dangerous the method of de Wecker of incising the sheath of the optic nerve without seeing it. WERNER.

CASTALDI (555) discusses in a long monograph the development of gray atrophy of the optic nerve. DANTONE.

HABERSHON'S (556) paper opens with a review of previous literature on the subject, and records twenty cases of hereditary optic atrophy occurring in seven families. Most of the affected individuals were smokers ; they presented the usual symptoms of the disease as described by Leber. Of seventy-five recorded cases, sixty-two occurred in males and thirteen in females, and of sixty-five cases in which the age at which the disease commenced is mentioned, forty-two occurred between thirteen and twenty-two. The author concludes that the hereditary taint does not depend on consanguineous marriages ; that there is in some of the sufferers a tendency to other nervous affections (epilepsy, insanity). Amongst the exciting influences must be mentioned the sexual system (menopause in women), and the toxic effect of tobacco, which in these cases produces a permanent failure of vision, which is not removed with the cause. The effect of syphilis is very doubtful. A list of references is given.

WERNER.

MACKENZIE (557) publishes illustrations and notes of the following cases : (1) neuro-retinitis from lead-poisoning, with changes at the macula suggestive of Bright's disease, but no albuminuria ; (2) post-papillitic atrophy and albuminuric retinitis.

WERNER.

PICQUÉ (558) presents a critical discussion of the views of Samelsohn, Vossius, Manz, v. Graefe, and Deutschmann. He be-

lieves that an inflammation, in order to reach the papilla, must spread from the meninges through the optic nerve, where the seat and nature of the disease will be found. The dropsy of the intervaginal space, as well as the œdema of choked disc, he ascribes to inflammation. v. MITTELSTÄDT.

The case of SCHIESS (559) was that of a girl aged twelve, who first noticed a disturbance in the sight of her right eye 1½ years ago. Choked disc, with tortuous blood-vessels, but good sight, was found. The eye was dislocated downward and outward; mobility good. V varied considerably, fell to $\frac{1}{60}$, and then rose again to $\frac{1}{10}$. Exophthalmus and immobility followed, with fatty degeneration of the retina in spots; a hard strand could be felt behind the globe. The tumor was extirpated, and proved to be a myxo-sarcoma, with a diameter of 20 *mm* between the dural and pial sheaths, which surrounded the optic nerve and bulged forward on sections. The great vascularity, the existence of large lymph-spaces in the tumor, and the diffuse infiltration with lymph explain the varying visual disturbances.

DE SCHWEINITZ (560) reports a case of unilateral (right) papillitis in a woman of forty years. There was nothing abnormal found on closest examination to account for it except an exposure to cold while overheated. The papillitis subsided under use of leeches, salicylate of sodium, and the iodides.

BURNETT.

In STEPHENSON'S (561) case, a child aged four, optic neuritis was discovered in both eyes after an attack of measles. There was nothing abnormal; urine free from albumen.

WERNER.

XVIII.—INJURIES, FOREIGN BODIES (PARASITES).

562. HUBBELL, A. A. The electro-magnet in the removal of steel from the interior of the eye. *Buffalo Med. Journ.*, July, 1888.

563. WAINEWRIGHT, B. Perforating wound of the cornea and iris, with a foreign body impacted in the retina. *Trans. Ophth. Soc.*, vol. viii., p. 289.

HUBBELL (562) reports on two cases of successful extraction of steel from the vitreous with the aid of the electro-magnet. In the one case perfect vision was restored; in the other useful sight was regained. BURNETT.

In WAINEWRIGHT'S (563) case a small metallic flake penetrated the eye, and was visible in the retina, surrounded by a white effusion; it gradually became covered with lymph, and was found encapsulated after enucleation. WERNER.

XIX.—OCULAR AFFECTIONS IN CONSTITUTIONAL DISEASES.

564. FERRIER and HORSLEY. Cerebral abscess. *The Lancet*, vol. i., No. 10.

565. GALEZOWSKI. Signes prodromiques de l'ataxie. *Tribune méd.*, Feb. 26, 1888.

566. GALEZOWSKI. Des troubles oculaires dans les altérations de la cinquième paire et en particulier dans les affections dentaires. *Progr. méd.*, 1888, No. 29, p. 41.

567. GRIFFITH, HILL. Functional eye-symptoms in hysteria and allied conditions. *Trans. Ophth. Soc.*, vol. viii., p. 292.

568. HANDFORD, D. Empyema, loss of vision in the right eye, afterwards in both; hemiplegia; death; cerebral softening, involving especially the angular gyri and occipital lobes. *Brit. Med. Journ.*, Oct., 1888, p. 992.

569. SAUNDBY. Tumor of the pituitary body. *Brit. Med. Journ.*, Dec., 1888, p. 1244.

570. SHARKEY. Case of cortical and subcortical disease of the occipito-angular region, producing hemianopsia. *Trans. Ophth. Soc.*, vol. viii., p. 314.

571. SIMI. Occhio e sifilide. *Boll. d'ocul.* vol. x., 20–21, p. 141.

572. SWANZY, H. R. On the value of eye-symptoms in the localization of cerebral disease. Being the Bowman lecture delivered before the Ophthalmological Society of the United Kingdom, November 9, 1888.

573. TAYLOR, LEWIS H. Ocular troubles as influenced by nasal disease. *Journ. Amer. Med. Assoc.*, November 17, 1888.

In the case of FERRIER and HORSLEY (564) there was double optic neuritis, with hemorrhages in the right eye, in addition to general cerebral symptoms and paralysis of the right side of the face and right arm. The patient recovered 24 days after evacuation by trephining. WERNER.

GALEZOWSKI (565) considers as characteristic prodromal symptoms of tabes, paralysis of accommodation, with simultaneous anæsthesia of the skin around the orbit, and the absence of mydri-

asis as well as of paralysis of other branches of the oculomotor nerve. The paralysis of accommodation of tabes is always confined to one eye. The paralysis of syphilis is never accompanied with anæsthesia of the skin around the orbit. MARCKWORT.

HANDFORD (568) observed a case of empyema, in which the loss of sight was the first symptom of brain affection, preceding the earliest symptoms of aphasia and hemiplegia by about 5 weeks. The right eye first became blind, and there were some signs of neuro-retinitis; this was followed by weakness of the right arm and leg, which went on to complete hemiplegia, and loss of vision occurred in the left eye also. The cerebral softening affected chiefly the occipital lobe and the angular, temporo-sphenoidal, and part of the ascending parietal convolution on the right side; on the left the occipital lobe, the angular, supramarginal, and first temporo-sphenoidal convolutions, and much of the frontal lobe

WERNER.

GRIFFITH (567) gives the following groups of cases: (1.) Hysterical blindness, mostly unilateral; (2.) unilateral amblyopia with achromatopsia and hemianæsthesia (Charcot); (3.) the same as above without hemianæsthesia; (4.) blepharospasm; (5.) conjugate deviation of both eyes; (6.) neurasthenic asthenopia. E. Clarke thought that many cases were not hysterical, but due to malingering, and that some might be attributed to central lesions.

WERNER.

SAUNDBY'S (569) patient, æt. 48, had been affected for 8 weeks with headache and diminution of sight. He suffered from somnolence and mental weakness, with occasional attacks of delirium. From the right nostril a liquid resembling albumen escaped. The conjunctiva of the right eye was almost completely devoid of sensibility; vision poor; the pupil contracted, irresponsive to light or convergence; the fundus normal. All the outer muscles were paralyzed except the superior and inferior recti; there was no ptosis. The left eye had no perception of light, the dilated pupil was immovable, complete ophthalmoplegia externa besides ptosis. The latter disappeared for a while, the vitreous became hazy in both eyes, and chemosis of the conjunctiva of the right eye developed. The post-mortem showed an epithelial tumor of the glandula pituitaria, which extended into both orbitæ, and had enveloped all the nerves. The condition of the chiasm is not mentioned, nor whether there was hemianopsia. The existence of the neuritis could never be determined. WERNER.

SHARKEY'S (570) patient, a man æt. 29, had been suffering since his ninth year from the ordinary form of epilepsy. Five years before his presentation his right arm and leg became paralytic from a cranial injury. He was just recovering from right-sided convulsions, which were followed by paralysis and hemianæsthesia. Afterwards optic neuritis and right-sided hemianopsia lateralis also developed. The patient then became comatose and died. The autopsy revealed a cavity in the left occipital and parietal lobe, and a thinning of the anterior half of the occipital lobe, the upper parietal lobe, and the upper end of the gyrus angularis. Almost the whole occipital lobe had been converted into a sarcomatous tumor, which almost reached the inner half of the capsula interna, but did not penetrate into it. No liquid was found in the nerve sheaths, but there was meningitis of the base of the brain. WERNER.

In an excellent lecture SWANZY (572) gives an able and critical review of the most recent and important works on the localization of cerebral disease in relation to eye-symptoms. The importance of entrusting the examination of the brain, in these cases, to skilled pathologists and microscopists is pointed out in the introduction. As a substitute for the term "indirect," as applied to symptoms which are not directly due to the focal lesion, the word "distant" (Fernwirkung) is proposed, and hence the expression "distant hemianopsia" is used. The subject is naturally divided into two parts, namely: symptoms derivable from the motor apparatus, and those due to disturbances of the visual functions. Under the first heading are discussed the various forms of conjugate movements, and those which are not associated, while under the latter we find hemianopsia, mind-blindness, alexia, and dyslexia (Berlin). There seems to be no doubt that the centres for color-, form-, and light-senses are all situated in the occipital lobe and posterior end of the occipito-temporal convolutions, though whether they are arranged in layers or placed side by side is unknown. An abstract of Dr. Verrey's case on color-hemianopsia with autopsy, which supports the latter view, is given. The lecturer stated that in the case of color-hemianopsia, published in the "Society's Transactions," vol. viii., there had also been partial night-blindness; the fact that this association occurred in other cases seems strong evidence in favor of a localization of visual memory very close to the visual centre. Gower's view, that, when mind-blindness results from disease of one hemisphere, it is

probably transient, is not supported by the above case, as the lesion was evidently unilateral, and the symptoms had existed five months when patient was first seen. In speaking of dyslexia, it is stated that "in every instance the lesion was on the left side of the brain, the patients being all right-handed." Mr. Swanzy has asked me to mention that in writing the above he had overlooked the fact that in Bruns' case (*Neurol. Centralbl.*, No. 2, 1888) nearly the whole of the right hemisphere was softened, while in the left the lesions were only microscopic. WERNER.

TAYLOR (573) is a believer in the frequent occurrence of reflex eye troubles from the nose. The eye-symptoms are mostly those of irritation and vague uncomfortable feelings, for which there seems to be no cause in the eyes themselves. The histories of four cases are given in illustration. In the treatment of nasal hypertrophies, he uses by preference the galvano-cautery.

BURNETT.

REVIEWS.

L. DE WECKER and J. MASSELON. **Manuel d'Ophthalmologie.** Guide pratique à l'Usage des Etudiants et des Médecins. Paris: Lecrosnier et Babé, 1889.

This manual is in reality a complete treatise of ophthalmology, a very detailed description of the anatomy included. It is a large octavo volume of 991 pages, closely printed in rather small type, and illustrated with no less than 576 wood engravings inserted in the text. The work is a condensation of the French edition of the "Handbuch der gesammten Augenheilkunde von Gräfe–Sämisch," by De Wecker and Landolt. The drawings of the "Manuel" are reproductions from the large work. The structural diseases—inflammations, cataracts, operations, etc.—are exhaustively treated, but it seems to us that the functional diseases—accommodation, refraction, motility, and the examination of the eye, those parts which, in the large work, are so masterly treated by Landolt—are too meagre in the "Manuel." Just 20 pages, *i. e.*, 2 % of the book, are devoted to refraction and accommodation and their anomalies, a group of diseases which is very important, very extensive, and difficult to master. We think we are not mistaken in asserting that fully 33 % of the private practice of many an expert and busy oculist are cases of diseases of refraction and accommodation.

As a text-book for the student the "Manuel" is too large; as a book of reference for the general and the ophthalmic practitioner it is excellent. A full and comprehensive table of contents and a carefully prepared alphabetical index will in any obscure case enable the practitioner readily to find the information he seeks. We all are indebted to Drs. De Wecker and Masselon for taking the trouble to present all the essentials of the voluminous ophthalmic encyclopædia in a treatise which in almost all of its parts is both concise and complete. H. K.

H. SCHMIDT-RIMPLER. **Ophthalmology and Ophthalmoscopy** for practitioners and students of Medicine; translated from the third German edition. Edited by D. B. ST. JOHN ROOSA, M.D., LL.D. 183 wood-cuts and 3 colored plates. New York: Wm. Wood & Co.

This very popular text-book, of which since 1884 four German editions have appeared, is presented to the English-speaking physicians in a very handsomely gotten-up octavo volume of 571 pages. The translator, whose name is not given, has done his share of the work well, and the numerous additions which the American editor has made, and which are recognizable by being put in brackets, increase the value of the book materially. H. K.

GEORGE A. BERRY, M.B., F.R. C.S. Ed., etc. **Diseases of the Eye.** A practical treatise for students of ophthalmology, with colored illustrations from original designs. Edinburgh: Young J. Pentland, 1889, pp. xxi. + 670.

This newest candidate for favor amongst ophthalmological students is designed to be purely clinical in character, and the plan is well adhered to throughout with the single exception of the chapter on optics, which precedes the consideration of anomalies in refraction and accommodation. Only such of the normal anatomy of the eye is given as is necessary for an intelligent understanding of the clinical aspects of the various diseases, while of pathological anatomy the author has, with commendable judgment, refrained from giving more than is requisite for correct diagnosis and the most approved treatment.

The late Horace Greeley was wont to say that a successful newspaper was made more by what it left out than by what it put in, and in reading this work of Berry's we have been forcibly struck by the rare good taste in the selection of that which is essential, which pervades it as a whole. The author seems to have the faculty, which is not so common as it should be, of viewing his subject as a whole and seizing the salient points and not confusing his reader—presumably a student and a novice—with a mass of details with no key to its unravelling. Long citations of authorities are not indulged in, yet it is apparent that the literature of each subject has been gone over in a very thorough manner. The author has no pet theories of his own, no special axe to grind, and the fact that he was writing a clinical treatise for the guidance of beginners, and not an encyclopædia, has evidently been always present with him. It is not to be supposed that the

reviewer or any one else probably would agree *in toto* with all that is affirmed,—the latitude for honest differences of opinion, where so much must be only a matter of opinion, is too great for that,—but it can be justly said that the student and young practitioner in ophthalmology, into whose hands this work may fall, will find it a safe and reliable guide to the diagnosis and treatment of diseases of the eye. This much in general.

The work is divided into seventeen chapters, and the arrangement differs somewhat from that found in the usual treatises.

For instance, one chapter (viii.) is given to foreign bodies in all parts of the eye, since they form a group of cases which clinically are the same. All the operations are considered together in one chapter (xvii.), which avoids an amount of needless repetition. Everywhere groups of diseases which clinically are allied are brought together as closely as may be, and for this reason extra-ocular tumors are given in a chapter to themselves (xii.), and not under the headings of the diseases of the different tissues in which they occur.

Without making insidious distinctions, we think that the chapter on glaucoma (vii.) is perhaps the most satisfactory, since it deals in the happiest way with a subject most difficult to treat in a concise manner. In the chapter on operations, extraction without iridectomy receives little more than a bare mention, which, in the opinion of the reviewer, is a mistake; and we confidently believe, from what we have recently seen of ophthalmic surgery in England, that in the next edition it will be given as prominent a place as it is sure to occupy by that time in the practice of the more advanced surgeons.

The number and excellence of the colored illustrations in the text deserve more than a passing notice. There are more than fifty of these, representing different forms of external and internal diseases, and all equal to the average of those found in the "Atlases." They may be said to mark a new era in book illustration. When it is said that the work is issued by Y. J. Pentland, it is equivalent to saying that it is every thing that a book should be in regard to type, paper, etc. S. M. B.

L. MAUTHNER. **Vorträge**, 13. u. 14. Heft. Augenmuskellähmungen: Diagnostik, Therapie, Prognose. Wiesbaden: Bergmann, 1889.

Mauthner has concluded his treatise on the **Ocular Palsies.** The first number, the "Nuclear Palsies," which appeared in

1884, has obtained a well deserved celebrity among neurologists and oculists. The second number—the "Non-nuclear Palsies": cortical, fascicular, basal, orbital, and peripheric—which appeared in 1886, is distinguished by the same industry, critical spirit, and clear style which mark the first. The present (double) number gives a complete analysis of the intricate symptomatology of the paralytic affections of the eye. The anatomy, according to Meckel, and the physiology, according to Listing, Donders, Helmholtz, and Hering, are very fully treated. The clinical exposition of the paralyses of the different muscles leaves nothing to be desired. The fundamental work of A. v. Gräfe is gracefully acknowledged, verified, sifted, followed, and enriched by the author's critical mind, on the basis of an extensive and well analyzed personal experience. As a peculiar feature we notice that Mauthner lays less stress on the inclination of the double images than on the increase of their lateral and vertical distances according as in different positions of the eye the respective component forces of the different muscles come into play. The manifestation of different strength of a muscle, in different but well-defined positions of the globe, forms the basis of the differential diagnosis of the paralytic affections of the different muscles. All possible—probably more than actually occurring—palsies are not only systematically described, but illustrated by numerous examples, so that the attentive reader is not only instructed, but also drilled in finding the right path in this maze of eventualities. The prognosis and treatment of the different kinds of ocular palsies are discussed with intrepid honesty, not with a spirit of nihilistic negation; yet nothing receives credit that is intrinsically hollow and only puffed by the prevalent fashions in medical thought. At times the author cannot suppress a little irony. Speaking of the local galvanization and faradization according to Erb and Benedict, he concludes: The electrical treatment may be continued for weeks, months, and, if the patient does not die or run away, for years."

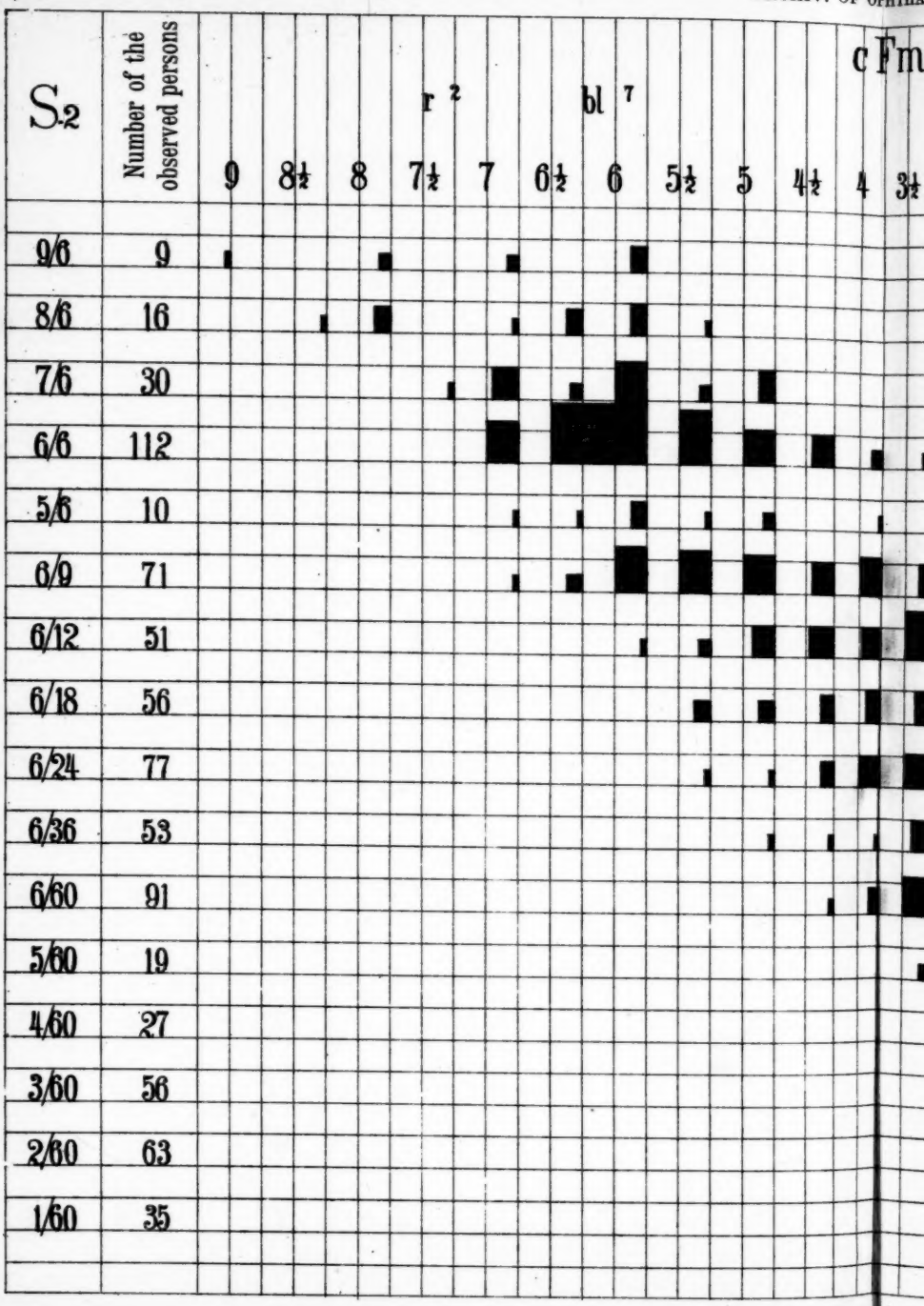
The chapter on the prognosis is supplemented by the cases of nuclear or non-nuclear palsy which have been verified by post-mortem examinations, and published since 1884. The disturbances of coördination, for instance the absence of the power of convergence while the lateral movements are intact, prove the existence of a special centre—situated in the corpora quadrigemina or the pons—by which the movements of the eyes are regulated.

The remarkable phenomenon of monocular diplopia—cases of which have been reported in England—is mentioned, but not explained. The author has seen only one case of this kind, the reviewer none.

Shall we, in conclusion, formulate our opinion on Professor Mauthner's treatise? It is this: An admirable didactic and critical essay on one of the most difficult branches of ophthalmology, highly instructive and fascinating for the oculist and neurologist; for the student of medicine, too lengthy; for the general practitioner, music of the future. H. K.

MISCELLANEOUS NOTE.

We regret to record the deaths of Prof. JULIUS JACOBSON, of Königsberg, and Prof. MAURICE PERRIN, of Paris. Their names will occupy honorable places in the history of ophthalmology.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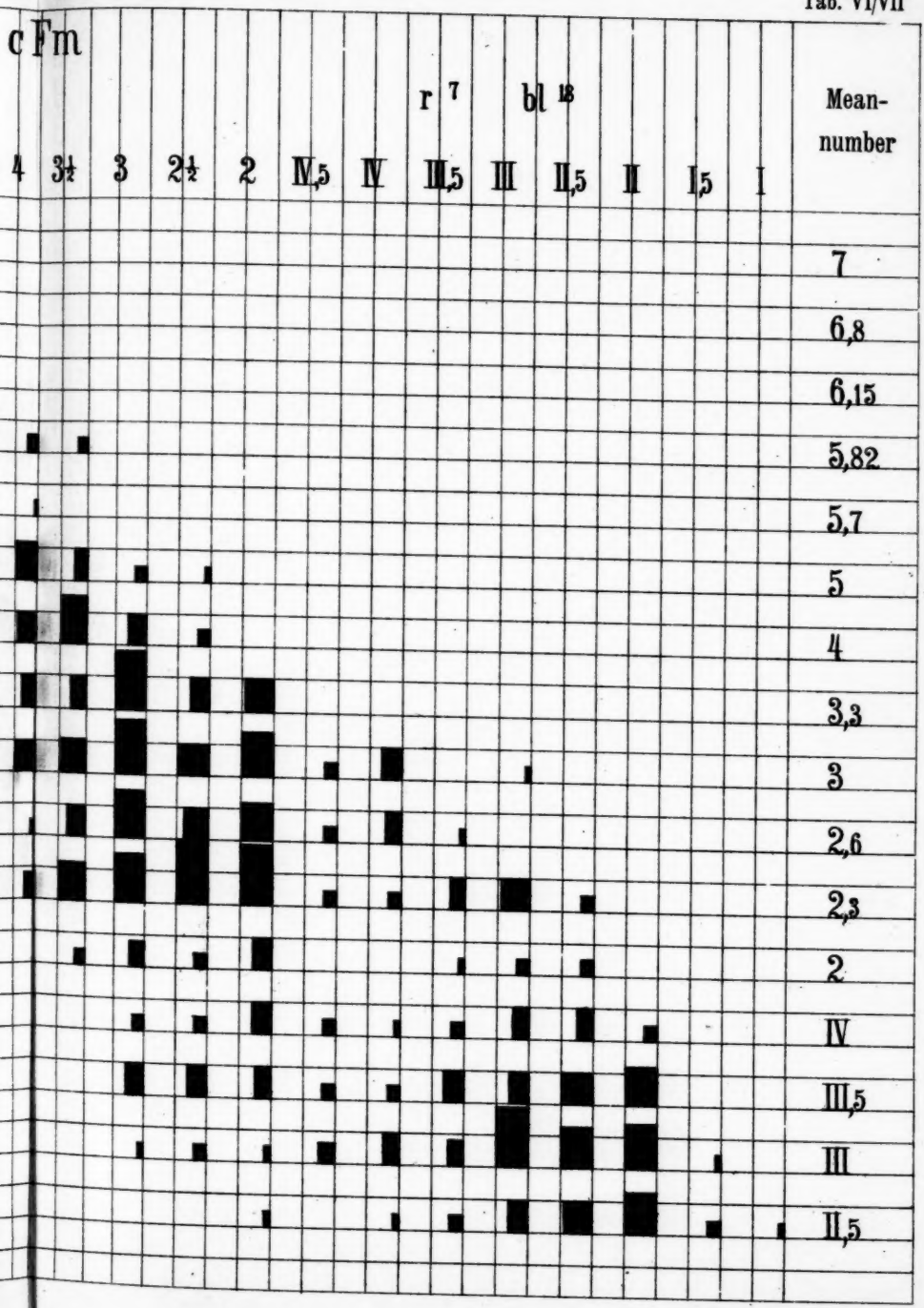
Tab. VI/VII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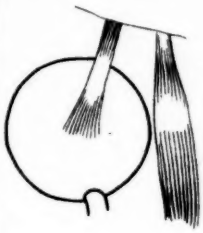

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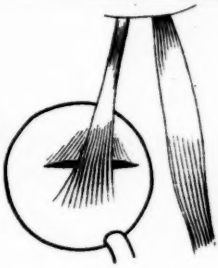

Fig. III.

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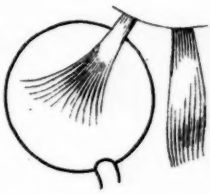

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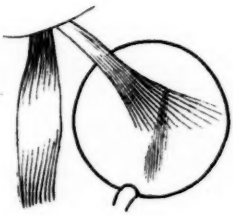

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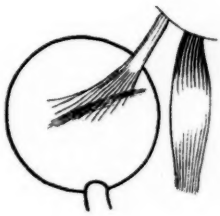

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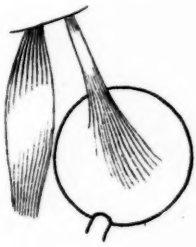


Fig. XI.

Fig. XII.

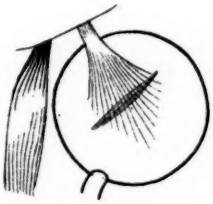


Fig. XIII.

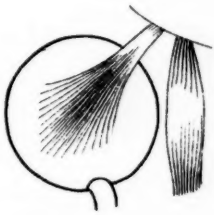
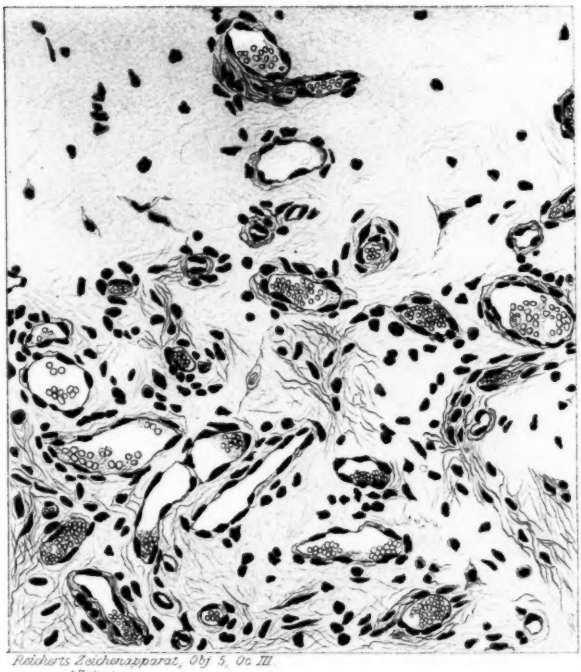


Fig. XIV.

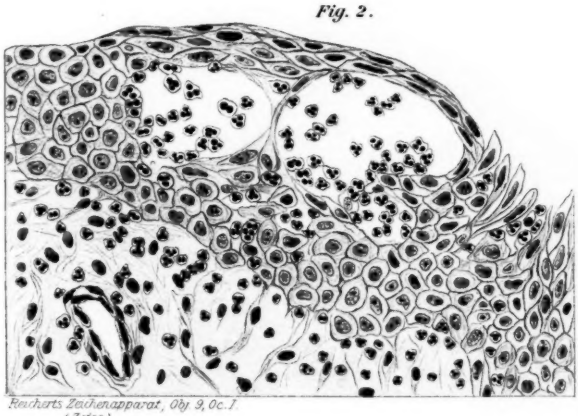
H. Stürtz, Würzburg.

Fig. 1.



Reichert's Zeichenapparat, Obj 5, Oc III
(Zeiss)

Fig. 2.



Reichert's Zeichenapparat, Obj 9, Oc. I
(Zeiss)

Lith. C. Kirst, Leipzig.

Fig. 1. B.

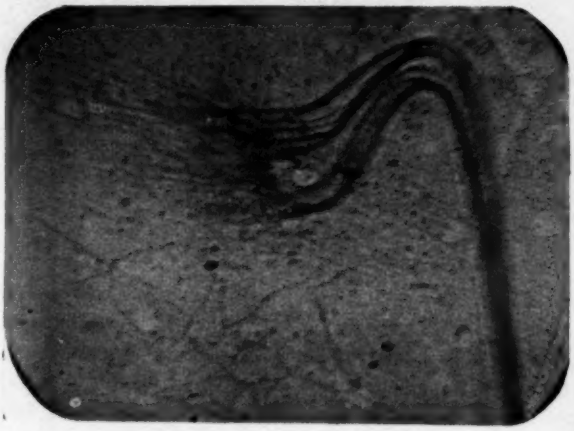


Fig. 2. C.

Julius Klinkhardt, Leipzig.